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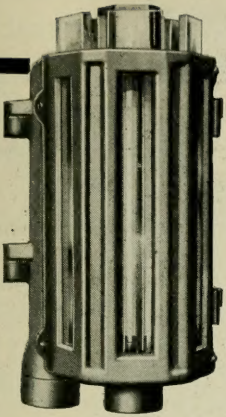

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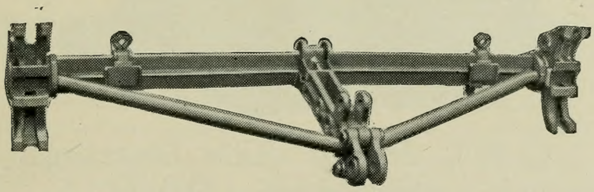

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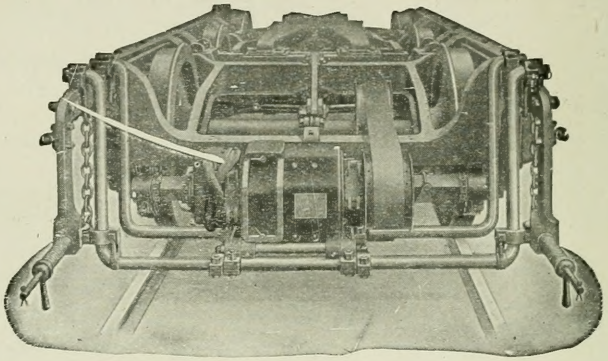

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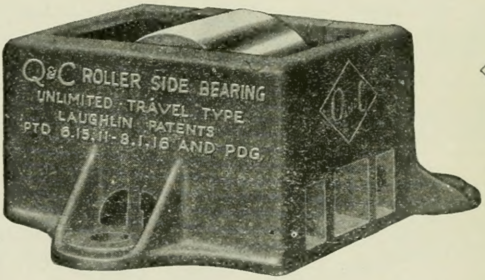

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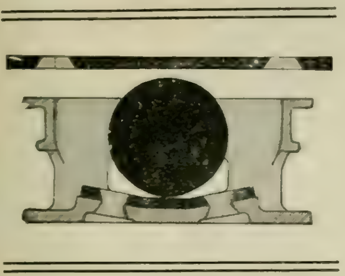

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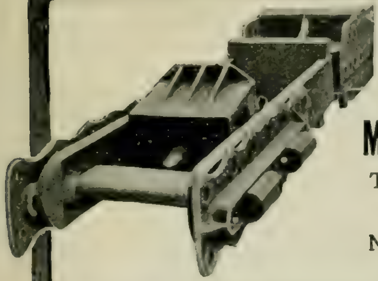

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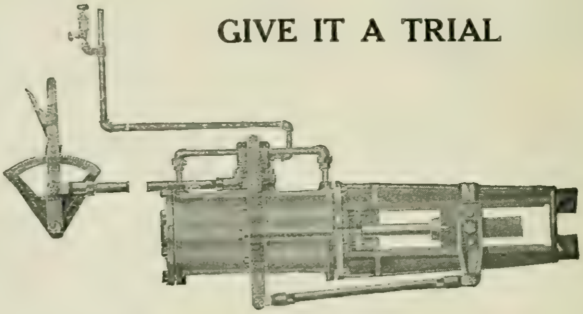

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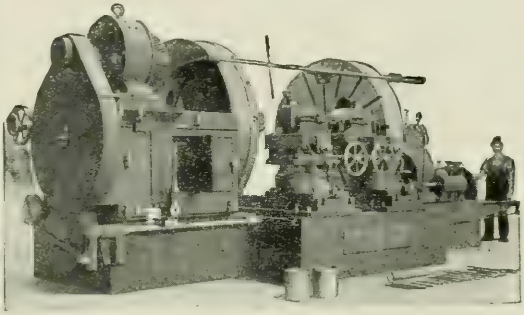

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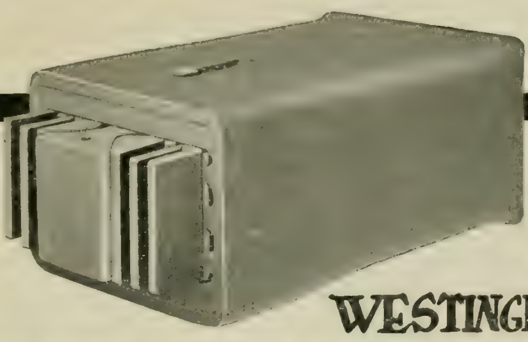

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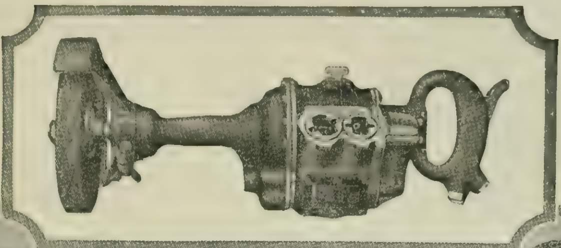

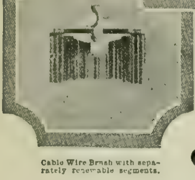

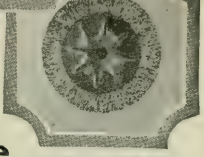

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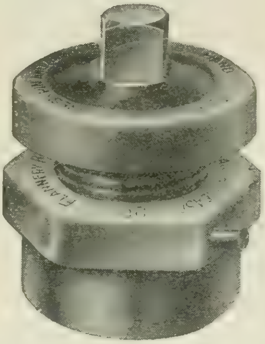

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INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	viii
American Brake Shoe & Foundry Co.	iii
American Locomotive Co.	vi
American Steel Foundries	xvii
Baldwin Locomotive Works	viii
Ball Chemical Co.	v
Brady Brass Co.	Front Cover
Chicago Pneumatic Tool Co.	ix
Chicago Railway Equip. Co.	xiii
Davis Brake Beam Co.	i
Dearborn Chemical Co.	iv
Flannery Bolt Co.	x
Fort Pitt Malleable Iron Co.	xi
Galena-Signal Oil Co.	xi
Gould Coupler Co.	ii
Graham Nut Co.	Front Cover
Hagan, George J. Co.	Front Cover
Hunt-Spiller Mfg. Corporation	x
Johns-Manville, Inc.	xvi
Johnson Bronze Co.	i
Locomotive Stoker Co.	xv
McConway & Torley Co.	xv
National Car Wheel Co.	iii
National Malleable and Steel Castings Co.	iv
Niles-Bement-Pond Co.	vi
O'Brien, Martin J., Co., Incorporated	Front Cover
Paxton-Mitchell Co.	iv
Pgh. Testing Laboratory	Front Cover
Pressed Steel Car Co.	xix
The Q. & Co.	ii
Railway Equip't. and Publication Co.	iii
Railway Steel Spring Co.	xvi
Safety Car Heat. & Lighting Co.	xvi
Schaefer Equipment Co.	v
Sipe, James B., & Co.	iv
Standard Safety Nut Corp.	Front Cover
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	iii
The Superheater Co.	Front Cover
Suydam, M. B., Co.	Back Cover
The Symington Co.	v
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xviii
U. S. Metallic Packing Co.	xvi
Vapor Car Heating Co., Inc.	xviii
Westinghouse Air Brake Co.	vii
Westinghouse Elec. & Mfg. Co.	vii

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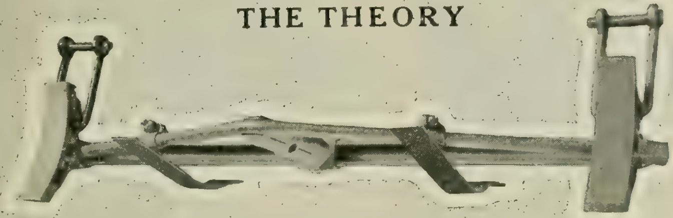

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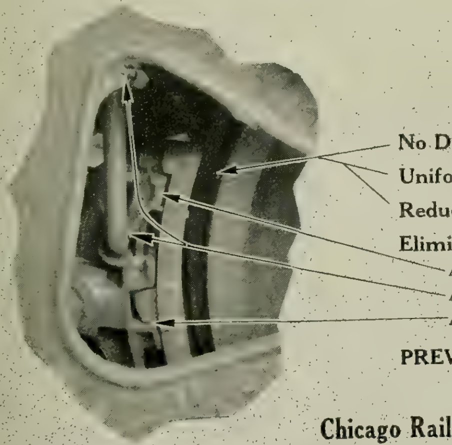

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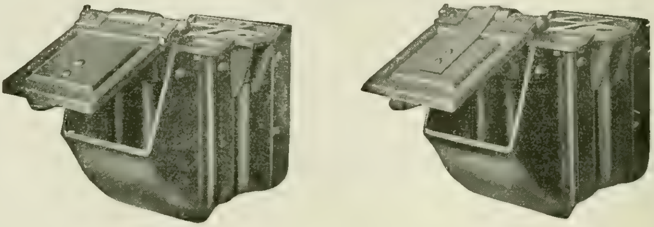

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Past Presidents

*J. H. McCONNELL	October, 1901, to October, 1903
L. H. TURNER	November, 1903, to October, 1905
F. H. STARK	November, 1905, to October, 1907
*H. W. WATTS	November, 1907, to April, 1908
D. J. REDDING	November, 1908, to October, 1910
F. R. McFEATTERS	November, 1910, to October, 1912
A. G. MITCHELL	November, 1912, to October, 1914
F. M. McNULTY	November, 1914, to October, 1916
J. G. CODE	November, 1916, to October, 1917
D. M. HOWE	November, 1917, to October, 1918
J. A. SPIELMANN	November, 1918, to October, 1919
H. H. MAXFIELD	November, 1919, to October, 1920
FRANK J. LANAHAN	November, 1920, to October, 1921
SAMUEL LYNN	November, 1921, to October, 1922
D. F. CRAWFORD	November, 1922, to October, 1923
GEORGE D. OGDEN	November, 1923, to October, 1924

*—Deceased.

Meetings held fourth Thursday of each month except June, July and August

PROCEEDINGS OF MEETING
NOVEMBER 28, 1924.

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., at 8 o'clock P. M., President A. Stucki in the chair.

The following gentlemen registered:

MEMBERS

Adams, W. A.
Ainsworth, J. H.
Anderson, A. E.
Arnold, J. J.
Balzer, C. E.
Barrett, R. L.
Bednar, Jos. J.
Berg, K.
Beswick, John
Blake, Thos. W.
Bonhoff, E. L.
Braun, O. F.
Burk, Geo. C.
Campbell, C. W.
Carlsson, John
Carr, T. W.
Cherry, J. T.
Chittenden, A. D.
Christiansen, Wm.
Christy, F. X.
Conway, J. D.
Courtney ,H.
Crenner, J. A.
Cruikshank, J. C.
Dambach, C. O.
Davis, Chas. S.
DeLeon, Paul
Donovan, J. J.
Downes, J. R.
Emery, E.
Farrinton, R. J.
Forrest, C. H.
Freshwater, F. H.
Fults, J. H.
Geisler, Jos.
Gilg, Henry F.
Glenn, J. H.
Gardner, K. C.
Goda, P. H.
Grieve, Robt. E.
Gross, Chas.
Hale, Chas. E.
Hansen, Wm. C.
Headington, R. V.
Heinlein, Geo. J.
Henry, C. L.
Higginbottom, W. C.
Hoffman, C. T.
Holbrook, W. H.
Holmes, E. H.
Howe, D. M.
Hulick, E. G.
Johnson, Wm. M.
Johnston, W. A.
Jungbluth, Adolph
Kegel, A. E.
Kelley, H. D.
Kelly, H. B.
Kessler, H.
Ketchpel, Paul A.
King, C. F., Jr.
Kranse, H. A.
Kroske, J. F.
Kummer, Jos. H.
Lanahan, J. S.
Landis, Wm. C.
Lappe, J. C.
Laughlin, Harry
Laughlin, R. J.
Lawson, A. F.
Leonard, C. W.
Lewis, Herbert
Lobez, P. L.
Lohr, Allen W.
Long, R. M.
Luddy, W. E.
Lynde, L. E.
Lynn, Samuel
Lynn, William
Malcolm, Elmer E

Miller, J.
Minnick, F. G.
Miessner, V. H.
Mitchell, F. K.
Mitchell, W. J.
Morris, J. H.
Muir, R. J.
Myers, Arnold
Myers, W. H.
McConnell, P. L.
McGeorge, D. W.
McLaughlin, H. B.
O'Connor, M. J.
Orchard, Chas.
Osborne, W. J.
Osbourne, Alfred S.
Padfield, Archie
Painter, Joseph
Parke, F. H.
Parker, W. G.
Peoples, J. S.
Price, W. F.
Proft, J. W.
Provost, S. W.
Ralph, Wm. E.
Ralston, J. A.
Rauschart, E. A.
Redding, D. J.
Redding, P. E.
Redding, R. D.
Reed, Fred W.
Reynolds, D. E.
Rick, R. C.
Riddile, D. E.
Roberts, Jas. E.
Robinson, R. L.
Rumbarger, F. A.
Posteraro, S. F.
Sattley, E. C.
Sawyer, R. W.
Schrecongost, C. P.
Seibert, W. L.
Seley, C. A.
Sener, H. H.
Severn, A. B.
Shannon, David E.
Shellenbarger, H. M.
Spielmann, J. A.
Stark, F. H.
Stenson, G. A.
Stewart, L. S.
Stucki, A.
Thompson, L. D.
Timme, W. F.
Ufer, C. E.
VanVranken, S. E.
White, A. B.
Wildin, G. W.
Wilson, W. J.
Winell, K. O.
Winslow, S. H.
Wyke, J. W.
Young, F. C.

VISITORS

Allen, Raymond
Allison, J. R.
Altsman, W. H.
Ashton, Wm. A.
Barber, Alexander
Barlow, S. J.
Beck, H.
Bell, W. R.
Blohm, A. H.
Boerch, I. F.
Boiselle, Ray
Brant, John G.
Dittman, Geo.
Doench, W. A.
Enlenstein, H. R.
Ericksson, E.
Farrinton, Arthur R.
Ferris, R. F.
Galbraith, Robt. M.
Greenough, Grafton
Harvey, Wm. E.
Hughes, Geo.
Hykes, W. H.
Jex, W. A.
Jones, Irving E.
Karns, C. A.
Kelly, W. A.
Knorr, J. J.
Lappe, R. W.
Mahan, W. C.
Morgan, C. V.
McGeary, E. J.
Nethken, H. W.
Obermeier, L. J.

Paschold, C. H.
Provost, Wm. J.
Purnell, C. C.
Reese, F. T.
Riddle, Wm. S.
Rushneck, G. L.

Shriver, Wm. W.
Temme, A. E.
Thomas, H. W.
Wheaton, L. B.
Whiter, E. T.
Williams, Harry

The call of the roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with as they are to appear in printed form.

The Secretary read the following list of applications for membership:

Altsman, W. H., Master Engr. & Painter, Harmony Railways, 67 Watsonia Blvd., N. S., Pittsburgh, Pa. Recommended by J. A. Ralston.

Anderson, F. W., Gen. Fore., Penna. R. R. System, 303 South Ave., Wilkinsburg, Pa. Recommended by P. H. Goda.

Ashton, William A., Die Foreman, Schoen Works, Carnegie Steel Co., 1136 Race St., McKees Rocks, Pa. Recommended by H. B. Kelly.

Bage, Ralph E., Mech. Expert, W. A. B. Co., 617 Swissvale Ave., Wilkinsburg, Pa. Recommended by R. M. Long.

Boiselle, Raymond, Rep., Westinghouse Air Brake Co., Wilmerding, Pa. Recommended by J. H. Glenn.

Enlenstein, H. R., Claim Investigator, Penna. R. R. System, 2217 Bensonia Ave., Pittsburgh, Pa. Recommended by C. T. Hoffman.

Fisher, Charles L., Claim Investigator, Penna. R. R. System, 917 Fulton Bldg., Pittsburgh, Pa. Recommended by C. T. Hoffman.

Gerard, F. R., Asst. T. M., Conemaugh Div., Penna. R. R. System, 19 Emerson Ave., Aspinwall, Pa. Recommended by T. M. Blakley.

Greenough, Grafton, Vice Pres., Baldwin Locomotive Works, 4808 Trinity Pl., Philadelphia, Pa. Recommended by J. D. Conway.

Heffelfinger, A. E., Sales Engr., The T. H. Symington Co., 233 Broadway, New York City. Recommended by E. Emery.

Hykes, W. H., Yard Master, Penna. R. R. System, Oakmont, Pa. Recommended by T. M. Blakley.

Joyce, Thos. J., Draftsman, Union Steel Casting Co., 62nd & Butler Sts., Pittsburgh, Pa. Recommended by H. F. Kirkpatrick.

Kilmer, George, Representative, The Bradford Corporation, 25 West Forty-third St., New York City. Recommended by J. A. Ralston.

King, O. B., Asst. C. C. to Gen. Mgr., Penna. R. R. System, 1009 Penna. St., Pittsburgh, Pa. Recommended by M. W. Clement.

Mason, S. O., Foreman, Westinghouse Air Brake Co., Wilmerding, Pa. Recommended by C. H. McKinstry.

McVicker, Wm., Foreman Car Repairs, Penna. R. R. System, Manor, Pa. Recommended by P. H. Goda.

Nethken, H. W., Vice Pres. & Gen. Mgr., P. & W. Va. Ry., 417 Wabash Bldg., Pittsburgh, Pa. Recommended by D. M. Howe.

Obermeier, L. J., Machinist, Penna. R. R. System, 610 Ninth St., Pitcairn, Pa. Recommended by E. G. Hulick.

Orme, Geo. G., Mgr. of Transp'n., W. J. Rainey, Inc., 1611 Oliver Bldg., Pittsburgh, Pa. Recommended by E. Emery.

Orr, D. K., Supt., The Monongahela Ry. Co., Brownsville, Pa. Recommended by C. P. Schrecongost.

Oskin, William, Asst. Fore., W. A. B. Co., Broadway St., East McKeesport, Pa. Recommended by C. H. McKinstry.

Paschold, Curtis H., Claim Agt., Legal Dept., Penna. R. R. System, 417 Chestnut Rd., Sewickley, Pa. Recommended by C. T. Hoffman.

Ridgeway, James F., Fore., P. & L. E. R. R., 715 Frederick St., McKees Rocks, Pa. Recommended by R. M. Long.

Schroyer, A. M., Rep., Inter-Heater Co., 605 House Bldg., Pittsburgh, Pa. Recommended by J. M. Bandish.

Shannon, Wallace R., Train Rules Exam'r., P. & L. E. R. R., 3111 Pioneer Ave., Dormont, Pittsburgh, Pa. Recommended by J. E. Hughes.

Shriver, W. W., Air Brake Instructor, B. & O. R. R., Cincinnati, Ohio. Recommended by J. H. Glenn.

Sproull, C. W., Mech. Engr., Union Switch & Signal Co., 113 Washington St., Edgewood, Pittsburgh, Pa. Recommended by R. M. Long.

Temple, Wm. J., Inspector, W. A. B. Co., 236 Santos St., East McKeesport, Pa. Recommended by C. H. McKinstry.

Terrill, Elmer F., Clerk, Ford Motor Co., 114 Grant St., Turtle Creek, Pa. Recommended by E. G. Hulick.

Wheatley, Wm., Inspector, Fort Pitt Malleable Iron Co., P. O. Box 1054, Pittsburgh, Pa. Recommended by J. A. Ralston.

Wheaton, Loren B., Elec. Engr., U. S. & S. Co., 726 Whitney Ave., Wilkinsburg, Pa. Recommended by R. M. Long.

Whiter, E. T., Regional Vice Pres., Penna. R. R. System, Penna. Station, Pittsburgh, Pa. Recommended by M. W. Clement.

PRESIDENT: As soon as these applications have been approved by the Executive Committee, the gentlemen will become members upon payment of the year's dues.

Brief reports were made by the Chairmen of the various standing committees.

Announcement was made of the death of Mr. E. H. Utley, Vice President and General Manager, Bessemer & Lake Erie Railroad Co., died November 8th, 1924.

PRESIDENT: Appropriate memorial will appear in the Official Proceedings of the Club.

If there is no further business, the next order will be the presentation of the paper of the evening. The speaker needs no introduction to railroad men. Mr. Grafton Greenough, Vice President of The Baldwin Locomotive Works, will address us upon the subject of "Locomotives."

"LOCOMOTIVES"

By Mr. GRAFTON GREENOUGH, Vice President, The Baldwin Locomotive Works.

Mr. President, Members of the Railway Club of Pittsburgh and Visitors—Greetings:

Before entering upon the paper of the evening, I desire to offer my tribute of respect and affection to Colonel E. H. Utley, whose passing away has already been referred to. I first met Colonel Utley many years ago. We all remember, with special gratitude, those who were kind to us when we were undertaking new activities. I was then making my first efforts in the selling of locomotives, and I shall always cherish the gracious and considerate manner in which the Colonel conducted all of his dealings with me.

He seemed to have the faculty of frankly looking at the other man's side of the question, so that he might deal justly and honestly in forming his decision concerning questions of policy. It is with these remembrances in mind that I submit these remarks.

When I proposed leaving the I. P. Morris shop, where I served an apprenticeship, to work over a drawing board in The Baldwin Locomotive Works, more years ago than any of you remember, an elderly Mechanical Engineer, taking a kindly interest in my future, said: "Don't do it, my boy—the locomotive is a finished idea—there is nothing left but to make them larger and that requires no engineering ability. Stay in the stationary engine work if you would be a mechanical engineer."

He then proceeded to predict that within 20 years electricity would supplant steam on all our railroads, and relegate the steam locomotive to exhibitions and museums.

My elderly friend was not alone in his beliefs—he had lots of company, and the actual outcome only serves to show how incompetent are our efforts to limit the possibilities of mechanical development.

As the score now stands there are more steam locomotives and larger steam locomotives in the world today than ever before notwithstanding electric transportation has developed to an extent never even dreamed of forty years ago, for electricity mainly does the lighter work. In the stationary field a like condition exists. Smaller plants are almost entirely operated by electricity, or internal combustion engines, while the steam engine is making new records in large units, although water produced electric power has made some inroads on both heavy locomotives and generation plants.

My old friend's prophecy in vision failed to conceive of the improvements which have since been adopted, such as:

Safety devices, including

High speed brakes, clasp brakes, universal use of automatic couplers and uncoupling devices, draft gear, cast steel frame, higher grade materials, steel wheels.

Instruments of economy, including

Compound cylinders, superheaters, automatic firedoors, feedwater heaters, stokers, exhaust injectors, booster, Nicholson Thermic Syphons or

Conveniences as: Power reverse, Okadee hinges, air sanders, metallic packing, grate shakers, and many more.

To cover the improvements in the manufacture and design of the locoomtive parts as known in the eighties would be to list all the parts of a locomotive and tender.

The process of manufacturing locomotives has improved. For instance:

Boiler seams are fitted with greater accuracy than machine work was given some years ago, and the riveting, spacing of stays and the location of braces are figured with precision. This greater care is brought about through the heavier demands which are now made on the locomotive boiler. In the eighties, boiler pressure ranged from 100 to 120 pounds per square inch. Now 200 pounds may be regarded as standard, 220 pounds as fairly common and 250 pounds pressure may not be unusual in the near future.

Many important parts which were formerly fitted in the erecting shop on the try and hit method are now built to gauges and templates so that the parts may be taken from one engine and put on another of the same class. This has brought about an improved method of erecting locomotives so that they will be properly put together in order that the wheels may run absolutely in line.

At The Baldwin Locomotive Works this is accomplished by erecting the locomotives on permanent forms fastened to base plates which are absolutely level and supported on foundations of concrete many feet deep. The front pedestals of the engine frames are supported on stands which are of the same level and absolutely square with the longitudinal line of the locomotive, while the rear end of the frames are supported on stands which are also level and parallel with the forward stands. While the forward stands are permanently located the rear stands may be moved forward or back to accommodate the length of engine frames which are being used. The cylinders are then fastened to the frames and the boiler, furnace bearers, crossties, valve motion supports and bumpers are permanently fastened to the cylinders and frames before the locomotive is moved from the erecting forms, therefore, when the engine is lifted by cranes and lowered on its own wheels, it is absolutely and permanently in line and square.

Before reaching the erecting shop the frames, boilers, cylinders and crossties are machined and fitted in their respective shop to templates, consequently, if any part does not fit in place during the erection process, we know immediately that something is wrong with that part, and it is shipped back to the machine shop for correction.

The tenders of today require heavier machinery to manufacture and handle them than the locomotive of 30 years ago, and the quality of tank work which is now expected is of a better grade than the requirements for boilers built during the eighties.

Cylinder castings which used to be more or less rough because it was practically impossible to keep molds for heavy cylinders to specified sizes. The modern cylinder is cast in permanent flasks in which a series of cores of accurate dimension form the mold. Hence, whether one or twenty cylinders are cast they will be practically of the same size and weight, and furthermore the quality of the work is of superior order.

It used to be common practice to roll locomotives out of the erecting shop to the shipping track and forward them to our customers who would sometimes spend a week or more in adjusting their various parts and breaking them in to the service for which they were intended. The modern scheme is different because all locomotives are now fired up and tested under running conditions over a trial track a mile or more in length, where any binding of the parts can be discovered and remedied and where the little things that used to annoy can be fixed.

While the locomotive builder is not 100 per cent perfect, yet he is continually striving in that direction, but the constantly increasing advance of the locomotive coupled with the complications due to multiplying specialties and labor-saving devices keep the manufacturer on edge constantly.

But the locomotive builder is more than perfect, judged by the standard of old locomotive specifications which were written on one page the size of a sheet of foolscap and left more to the imagination than they stipulated. Modern locomotive specifications are formidable documents often covering every detail, from the analysis of material to the construction of all parts of the locomotive and covering from 50 to 100 pages of closely written directions, so that nothing is left to chance judgment. The following up of such instructions demand the co-operation of careful work, trained supervision and untiring inspection.

It is interesting to reminisce a bit as we have been doing, but it is in a way as important to find where the ideal locomotive is leading us in the realm of progress, as it is to know what we are now doing.

When my old friend predicted the wonderful possibilities for the electric locomotive he was to some extent right, because electric locomotives have shown their ability to do wonderful work. It is said in the physical world that water finds its own level, and it may be said with equal truth that economic values find their own level in the transportation field. The carrying of passengers or freight from one side of the country to the other is an economic problem coupled with mechanical and commercial limitations and we find that, irrespective of what our sentiments may be in the course of years the commercial question of what pays best, all things considered, is often the deciding factor. Up to the present time the electric locomotive has not proven as flexible a unit of power as the steam locomotive. The economy which it is able to maintain at certain speeds and under given loads fades away under varying conditions affecting the speed and load increased or decreased to a greater extent than the economy of steam locomotives fluctuates under like changeable conditions. So it is more economical to use steam locomotives than electric locomotives under the majority of conditions which exist on our railroads, and for that reason the steam locomotive is still holding its own where dollars and cents hold the whip hand.

There are conditions, however, which outweigh in influence the mere cost of operation. For instance, New York City is approached from several sides through tunnels in which the density of traffic precludes the possibility of using steam locomotives without a ventilating system of prohibitive cost; therefore, electric locomotives are used in New York and vicinity. In some mountain work where heavy trains are hauled up and down long mountain grades, the electric locomotive shows greater economy than on level roads because of the regenerative principal recently put into practice whereby the trains on the down grade are held to desired speeds by arranging the motors of the electric locomotive to act as generators which pump back into the power line electric current which in turn assists in hauling other trains which are moving upward. The effect may be likened to two elevators on the same rope which passes over a sheave, so that when one elevator is going up the other is going down, and it only requires an amount of power sufficient to overcome the friction and varying loads of the elevators to operate them because the one balances the other. Then again, it is convenient to use electric power to carry passengers through our city streets and on short suburban lines where the traffic is more or less dense, but as soon as the traffic dwindles the added cost of electric operation becomes more apparent, because of the overhead which electric transportation has to bear due to the maintenance of power houses, power lines and the leakage of electricity through transmissions, which expenses do not drop in direct ratio to the reduction in traffic.

Electricity would have made much greater inroads upon the steam locomotive long ago were it not that the steam engine has been steadily improved both in design and equipment, and the end is not yet in sight. Steam locomotives progress in cycles. For instance, the earliest engines used crank axles and when it became common practice to place the working parts outside of the driving wheels, it was thought that the day of the crank axle had vanished. But the addition of more than two cylinders for compounding led us some years ago to place some of the cylinders between the frames of three and four-cylinder locomotives both here and in Europe, and revived the use of the crank axle. Many of the three-cylinder locomotives and most four-cylinder locomotives gradually gave way to superheated locomotives which promised a greater economy by simpler means, hence the interest in multi-cylinder locomotives waned and we again felt the crank axle was doomed to a long rest. With the advent of the superheater it was first thought that like oil and water, superheating and compounding would not mix in a locomotive, but we have since ascertained that the one augments the other, and consequently we may soon expect to see compounding revived in one way or another, which will add another hill for the electric locomotive to climb before it can pass the steam locomotive in the greater part of its activities. An interesting revival of the use of the crank axle appears on the horizon in the three-cylinder type of locomotive, which the American Locomotive Company has been so active in promoting during the past couple of years. Three-cylinder locomotives like balanced compound engines, will undoubtedly show added efficiency per given weight of driver, as compared with two-cylinder engines having the same driver weight and there are no mechanical reasons why these engines should not prove wonderfully efficient if they are accorded the care on the road and in the shop to which they are entitled because of the additional work which they can do. The only question concerning their use is one which the railroads themselves must answer, and that is, will the railroads be sufficiently interested in the added operating economy to make a lesser additional expenditure for maintenance. It is not generally known that the best and longest-lived crank axles have been made in this country, their life being from four to five times that of the crank axles used in foreign locomotives of less than two-thirds the weight and power of their American cousins. Whether the three-cylinder has come to stay or go is not dependent upon any mechanical problem, because all its problems have been solved sufficiently to meet all practical requirements in four-cylinder locomotives which embody all three-cylinder problems, and some of them in greater degree. The question is: Has the weight and size of locomotives increased to such an extent that it will pay the railroad to add reasonable complications in design to avoid greater increase?

A simple means of increasing the economy of locomotives which is attracting some attention, is the use of short maximum cutoffs for the locomotive cylinders. The Pennsylvania Railroad has nearly 600 Decapod locomotives whose valves are set to the maximum cutoff of 50% and as these engines under favorable conditions develop a horse power for less than two pounds of coal, they rank first in the list of economical locomotives on American railroads. A part of their economy, however, is due to the use of type E superheaters instead of the type A which is commonly used and also to the application of feed water heaters.

The Booster is a device which has performed an important function in extending the useful lifetime of locomotives whose burden have grown through increasing train loads to such an extent that without aid they would be relegated to branch lines or the scrap heap. The Booster which is applied to the trailing wheels of a locomotive performs a function well covered by its name, because it literally boosts the locomotive over the hard places and automatically drops out of action when the engine is well under way, and were it not for the booster an engine with greater tractive power would be needed for the work.

Likewise the booster performs a useful function with new locomotives that have grown through successive improvements to the limit of size which may be used on certain divisions. In such cases the booster by taking temporary advantage of the weight on trailing trucks permits a smaller locomotive to do the work which otherwise would require a larger one.

The problem of supplying sufficient steam to the relatively large cylinder necessary to the traction demands of modern service would be difficult to meet in most cases and impossible of accomplishment in others were it not for the water and coal saving abilities of the superheater and feed water heater. It would seem that as the need arises some improvement stands ready to supply the want and assist the steam locomotive in maintaining its supremacy. Looking into the future of the steam locomotive, we find that over in Sweden and Germany efforts are being made to still further reduce the amount of coal and water required, by developing condensing turbine locomotives.

The use of compressed air in locomotives has been confined to engines operating in places where fire must be guarded against at any cost because no one has yet been able to compress air and then expand it without the loss of much energy through the dissipation of heat generated by rapid compression.

A new rival to the steam locomotive however, is just beginning to crop out in the shape of internal combustion engines. The Baldwin Locomotive Works at this time is building a Diesel type oil engine of approximately 1,000 horse power capacity. This engine will have a tractive power ranging from 16,000 pounds at 20 miles per hour to 54,000 pounds at 6 miles per hour, and is designed for heavy road service. This is the first attempt to utilize internal combustion locomotives for rivaling steam locomotives of modern type and size and while it is not of the capacity of the largest locomotives, it will compare with the average freight engine of the present time. In order to avoid the mechanical complications due to the use of clutches, geared-transmission and shifting gears; the transmission will be of an electric type designed by the Westinghouse Electric & Minufacturing Company of your city, hence Pttsburgh and Philadelphia are working hand in hand to this end. In the language of the layman the motor will operate a generator from which the current will flow through motors on the axles of the locomotive without using intermediary storage batteries. The difficulties attending the use of the Diesel engine hitherto for transportation motive power may be summed up in two causes. First, it has not been possible to design an oil engine of the necessary capacity within the weights or sizes available for locomotive work. In other words the weight of the oil engine per horse power has been prohibitive for too little energy was obtainable in proportion to the weight on driving wheels. Then it has been difficult to transmit the energy of the motor to the locomotive drivers without undue loss. We have no doubt that the present efforts will prove successful as to both counts. The oil engine will probably cost more per horse power to build than the steam locomotive, but it will cost much less to operate. It shares with the electric locomotive the absence of smoke and the ability to operate in places where steam with its accompanying furnace is objectionable and it also has the advantage over the electric locomotive and the steam engine in that it ceases to use fuel when it stops working with the added advantage over electricity that it is a self-contained unit and requires no power house with its multitudinous outside equipment and corps of engineers and lines. It does not share the electric engine's ability to work in tunnels and unventilated places without fouling the air.

We are, therefore, looking forward to the trial of this engine next year with a great deal of interest and we are predicting a good report of its efforts.

Beyond the suggestions for the future which we have just considered, are the visions of the dreamers who expect to extract energy direct from the sun's rays without the use of fuel together with those who expect in time to divide the atom and govern its forces in spite of the warning of some scientists that the explosion of a single atom will be sufficient to destroy a city. We are moving in a rapid age and each new system of transportation develops quicker than its predecessor, hence it would not be safe for anyone who has seen many things accomplished which only a few short years ago were deemed impossible to predict that we are anywhere near the end of human achievement in the way of transportation.

The more civilized man becomes the more transportation becomes a necessity. In prehistoric days it was largely immaterial whether a man moved from one place to another except to escape capture, but in recent years with our crowded cities and distant sources of supply, transportation is the keynote of our prosperity and the locomotive whether it be steam, electric, air or oil remains the ruling factor of transportation. Consequently the study of locomotive improvement is one of the most important phases of usefulness in which we can engage.

PRESIDENT: I thought I knew all about locomotives, but I find I was mistaken. The subject is now open for discussion and it is desired that a great many of you will avail yourselves of this privilege and if anyone has any questions to ask, please do so, as Mr. Greenough will be glad to answer them as far as possible. In the meantime I am going to call upon Mr. Whiter, Regional Vice President of The Pennsylvania Railroad System, who surely has something to say to us.

MR. E. T. WHITER: I have been very much interested in the talk that has just been given us. It is illuminating in every way. I am not a mechanical man and any question I might put might seem foolish to men who are of a mechanical turn of mind. Therefore I would prefer to listen.

All I wish to say at this time is that I am very glad indeed to have the privilege of being present with you. I appreciate the courtesy that has been extended to me and I hope at some future time to become very much better acquainted with the members generally.

PRESIDENT: That is modesty indeed. I see Mr. Nethken in the audience. Have you anything to add?

MR. H. W. NETHKEN: I thank you very much, but I would prefer to do as Mr. Whiter said—listen.

PRESIDENT: If that is to keep up I will call upon someone who will say something, one who knows a locomotive and who has never yet failed to help out in a pinch. Mr. Redding.

MR. D. J. REDDING: I thank you for the compliment contained in your remarks, but must say that I find nothing to criticise in the paper that Mr. Greenough has given us. I agree fully with everything that he said and particularly with his remarks about the continuance of the steam locomotive in spite of the growth of electric transportation. I am a steam locomotive man and I am not ready to quit in favor of electricity, internal combustion or any other of the later developments. I believe we shall have steam locomotives handling the bulk of the business of this country for a long time to come. There has been a lot said in the past few years about electricity displacing steam, and the steam engine has been said to be a back number. The electric locomotive is here and is doing a wonderful work in the places where it is unquestionably the best facliity to use, and there are many such places. The trouble has been, however, that in most of the discussions about the relative efficiency of steam and electricity, the steam locomotive referred to was the old-timer which we had years ago, and about all we had at that time was a pair of cylinders and a few pairs of driving wheels and connecting rods, with a boiler mounted on them. They were of light capacity, hauled light trains, made light earnings. Such locomotives were outgrown, however, a number of years ago. Trains are larger, boiler capacity and pressures have been increased, together with the size of the cylinders and the distributing parts of the locomotive.

so that the old-time steam locomotive is now out of the running. We have some of these old-timers which are very handsome looking pieces of machinery, which we would like to sell. They are too light for us, yet in their places they are very good locomotives. Practically every railroad in the country has some of these old-time locomotives for sale. We are not, however, in a position to dispose of any of the modern steam locomotives.

At the Atlantic City Convention in June, Mr. Winterrowd, of the Lima Locomotive Company, read a paper, which was printed in the daily edition of the "Railway Age" June 13th, and which discussed the relative capacity of modern steam locomotve boilers and modern stationary boilers to produce steam at low cost, and it was demonstrated that the locomotive boiler is by far more efficient than any of the up-to-date stationary boiler equipments. These conditions were made possble by the improvements mentioned by Mr. Greenough and some others, and yet we feel that the surface has only been scratched and that there is plenty of room for development in the design of the boilers and the auxiliaries both of the boilers and of the locomotives, all of which will tend to lower the cost of operation and help to bring down the cost of transportation.

One of the boiler auxiliary improvements which I did not hear mentioned was the Nicholson syphon which has been applied to quite a number of locomotive boilers in the past few years and which is said to greatly increase the steaming capacity and lower the cost of producing power. The booster is another feature mentioned by Mr. Greenough and if so happens that on our railroad we have a number of these boosters in service and have a very vivid example of just what they will do to help the locomotive. On a certain type of locomotives to which we are applyng these boosters, the engines, prior to application of boosters, are given a certain tonnage to haul. As fast as these engines go through the shop and come out equipped with a booster, that tonnage is increased by 500 gross tons and this increase adds to the earnings for each train hauled a very considerable sum which, in a short time, will pay for the cost of installation and upkeep of the booster many times over. All of the features mentioned by Mr. Greenough make for increase in efficiency of the boilers and of the locomotives and we still feel that we are only in the process of development of the steam locomotve.

PRESIDENT: Are there any other remarks? It comes to my mind that we have with us a member of a good many years' standing, but who does not come to our meetings as often as we would like to have him. Mr. Seley.

MR. C. A. SELEY: I would like to approve very cordially of everything Mr. Greenough had to say. The locomotive is a wonderful machine, especially to those of us who have to do with engineering.

It has been my good fortune to be connected in a way to learn quite a little of locomotive design. I was particularly struck with some of the references of the speaker to the old locomotives. I recall an engine built in the year 1861. I first saw that engine 56 years ago as a boy. It was on exhibition in Chicago this year with a number of old coaches and a sleeping car, exhibited in comparison with the latest Oriental Limited Trains of the Great Northern Railroad.

That engine has 12½ square feet of grate area, 12 by 21-inch cylinders and carried 120 pounds of steam, just about one-eighth all the way through of what we recognize as a fairly proportioned engine at the present time.

I put in eleven years on the Rock Island road. When I went there the ten-wheel engine was king, with 130,000 pounds on the drivers. In eleven years they had 240,000 pounds on four pair of drivers. Remember, that was nearly twenty years ago.

We cannot keep on indefinitely adding brute weight and brute strength to locomotives. We have already forced the rail makers, track construction, the bridge and viaduct builders to what we would think is the limit, but there does not seem to be any limit. At the same time it behooves us to look out and apply locomotive weight to its greatest advantage to deliver power at the draw bar.

I have specialized more particularly on the boiler; and as has been stated, we have the stationary boiler, the improved high grade evaporated unit that we find in power houses to compare with. You do not find the locomotive type boiler in high-grade power houses. We do not get the evaporation from the locomotive boiler that we could get if it had all the functions in operation that the high-grade stationary boiler has. At the same time, within the limits of a 4 foot 8½-inch gauge, you have a tremendous power house of 3,000 or 4,000 H. P. at times in the modern locomotive.

I am wondering how the 1,000 H. P. oil engine Mr. Greenough tells us about is going to stack up. I might know a little more about it if I had taken an opportunity to go across to that Convention that was held recently in Berlin. I sent a paper over in accordance with a request and I did think of going over, but finally determined that I would stay at home. The Germans over there got together a wonderful exhibit of 100 locomotives, steam, electric, internal combustion, turbine and all the variations they could gather up in Europe. It would be very interesting if we could get some one to tell us what each development really meant. I think we will have descriptions of it in the Press a little later when it filters through.

Reverting to the matter of the boiler, of that little old number one Great Northern engine that I spoke of. If you figure out relative proportions of the grate and heating surfaces, the ratios are very much in proportion to what we are employing today in engines that are eight or more times as big. We have not gone ahead in the improvement of the boiler nearly as far as has been done with reference to the engine part of the locomotive.

Sometime ago I developed the angle of ascertaining what the evaporation was per pound of material, how much a pound of material in the fire box would evaporate and how much a pound in the flues would evaporate. While the ratio is between 5 and 6 to when comparing evaporation of heating surface of fire box to flues, I found that in the average locomotive it is a 2 to 1 proposition in weight, which seems to be a very important consideration. In other words, the development of the future for additional weight and for costs should look to the fire box end rather than to the other end of the locomotive boiler.

I found there was a difference in the evaporation of flues, as between 18 feet and 23.5 feet of 15½ per cent and we cannot afford to stretch out flues to where their efficiency is so low and the loss so great.

Reference has been made to Thermic Syphons. Since they have been mentioned I might say that the syphon is a fire box device and very near the shovel, and that is where you want to be to save fuel and promote evaporation and at the same time produce active circulation. Circulation of the boiler water is the big point of difference as between the ordinary locomotive boiler and the big high-grade stationary boiler and has very much to do with controlilng temperature stresses in the structure and effects reduction of maintenance and increase of life.

Due to the extraordinary service the locomotive boiler is called upon to perform, it is not surprising that, as compared with stationary boilers, they require a great amount of care, repairs and renewals. Any device, therefore, that favorably affects these features not only saves money, but adds that most important feature of serviceability which figures big these days.

If you are interested in that weight question look up my article in the Railway Age for the 17th of May, this year.

The three-cylinder locomotive has been referred to. I was told by a Mechanical Engineer of one railroad that an engine of that type on another road was cutting circles around the record of their two-cylinder locomotives in similar service, and I rather look to a considerable development of that type in order to obtain capacity and speed for service where the Mallet has proven too slow.

These are the main points I had in hand, Mr. President, and wish to thank you for calling on me.

MR. GRAFTON GREENOUGH: I would like to supplement my remarks with this statement. When touching on a few of the modern ideas which have developed into new appliances and specialties for locomotives, I did not pretend to give all of them the time which their merits deserve because the shortness of the evening made it necessary for me to confine my remarks to a few examples of progress without prejudice to those devices which were not mentioned.

PRESIDENT: Mr. Dambach, can you tells us something about these questions?

MR. C. O. DAMBACH: I do not know what gave you the impression that I know anything about locomotives as my reason for being here tonight is to learn something about the subject.

I was interested, however, in Mr. Greenough's statement to the effect that he could give us a better locomotive if we would take better care of it, and there is no question that if we would revert to our former custom of assigning locomotives to individual engineers they would be much better taken care of than with our present practice of pooling our power, but with the increase in price of locomotives and reduced working time of engineers it is a question whether such a move would be in the interest of economy.

As to the internal combustion locomotive, if this proves to be a success, it might possibly enter the same field as the electric locomotive and be the solution of some of our problems in congested territory and might make it possible to reclaim valuable property by abatement of the smoke nuisance.

In regard to electrification, I fully agree with Mr. Greenough that at the present time this is a wealthy man's proposition, but personally I would be interested to know, and it might prove of interest to our members, the reason for the different changes in types of electric locomotives. My understanding is that the original installation of this class of equipment was on the same principle as an incline without a cable and the motors were accelerated while going down the hill and decelerated while ascending. For some reason the railroads got away from this type of equipment and just recently two railroads, one of which was Mr. Ford's line, have again reverted to an installation similar to what was originally put on the market.

MR. GRAFTON GREENOUGH: I understand you refer to the regeneration of current by electric locomotives. This procedure, like nearly everything else which has been tried in the railroad field, proved more or less futile at first through technical defects or lack of understanding by those attempting to make use of it. These difficulties are now regarded as past history and regeneration is now common practice. For instance, the Chicago, Milwaukee and St. Paul Railway make use of its principles throughout the mountain territory where their road is electrified, both in the Rocky Mountain regions and the Cascade Mountains.

PRESIDENT: We appreciate very highly that the railroad men of Pittsburgh so generously patronize their Club, but we appreciate still more the presence of those who find it worth while to come a long distance to meet with us. Such a member is here tonight—Mr. A. B. White of DuBois. May we hear from him?

MR. A. B. WHITE: I wish to voice my appreciation on the fine lecture we have had tonight on locomotives. I have enjoyed it very much. We have a Mallet operation on the Middle Division of the Buffalo, Rochester & Pittsburgh Railway, between Salamanca and Punxsutawney, these engines being equipped with about all of the appliances for locomotives mentioned by the speaker, and we like them very much. The speaker referred to the three-cylinder engine, as well as the four and two-cylinder engines, but I did not hear him say anything about turbine engines, that we read so much about in scientific papers, and which I understand the Swedes have perfected. I was wondering whether the turbine engine may not have its place along with the electric and other engines mentioned, and if it does not take up too much of Mr. Greenough's time, would like very much to hear what he has to say about the turbine engine.

MR. GRAFTON GREENOUGH: I think the answer to your question regarding turbine locomotives hinges on one word, as the gentleman spoke of, the Swedes having perfected this type of locomotive. I feel that the word perfected is premature because we are advised that only one locomotive has been in service for a substantial period of time, although we are further advised that additional engines have been built or are building.

The Baldwin Locomotive Works sent engineers to see the locomotive in operation and found that the locomotive presented many novel features which may or may not develop usefully. The fundamental factor in the locomotive appears to be the condensing system, rather than the turbine engine, which is designed to conserve water and use it more economically than in the non-condensing engine. I presume the gentleman refers to the Ljunstrom engine, in which the forward unit comprises the boiler and the engine and driving wheels support the tender which follows. In addition to carrying the water, the tender provides an air cooling system which, it is claimed, proves satisfactory in Sweden, but whether this system is practicable for the warmer portions of the United States, where the temperature in the shade ranges from 110 to 120 degrees, is more or less problematical, especially if the locomotive is operating under full load at low speed.

The Germans are also working on a condensing turbine locomotive which was illustrated in the Railway Age a few weeks ago. This locomotive, in appearance, differs less than the Swedish engine, from commonly accepted types of locomotives because the turbine engine is placed where we are used to seeing the cylinders of locomotives and the driving wheel arrangements are unchanged. The locomotive is provided with a water-cooled condenser, which is designed to overcome the difficulties usually encountered with direct air cooling. We can only conjecture what the future of such an engine would be on an American railroad, but I feel its chances are small when we consider how, even the simple addition of a third or fourth cylinder to existing types of locomotives is opposed.

PRESIDENT: We would like to hear from a man who has spent many years of his life right on a locomotive, Mr. W. J. Wilson.

MR. W. J. WILSON: You want to know something about the construction of a locomotive? I could not tell you very much. I have run a locomotive for a long time, but I would not understake to speak upon the building of locomotives.

PRESIDENT: If there is no additional discussion we will have some moving pictures showing how the locomotives are being built.

Motion pictures were then shown of the actual erection of a large locomotive, which were both interesting and instructive.

At the conclusion of the films, a unanimous rising vote of thanks was tendered the speaker in appreciation of his address and illustrations. There being no further business, upon motion the meeting adjourned.

J. D. CONWAY, Secretary.

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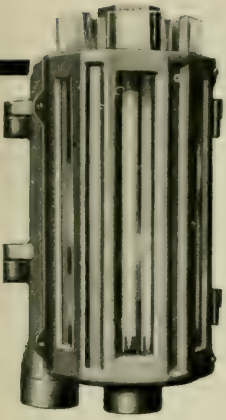

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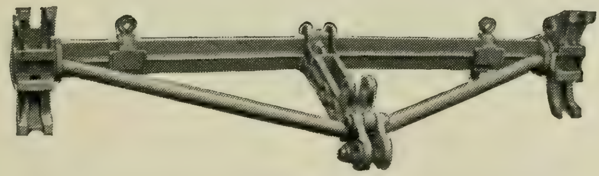

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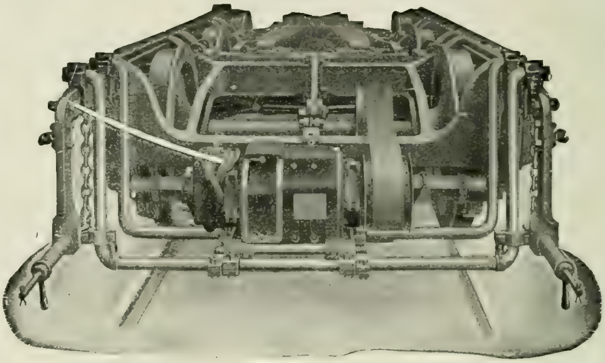

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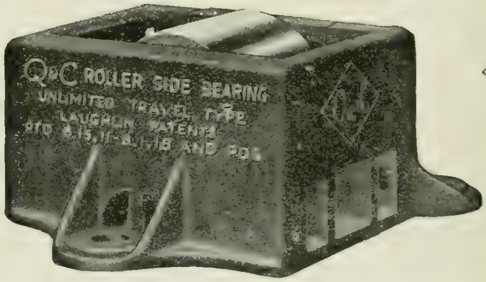

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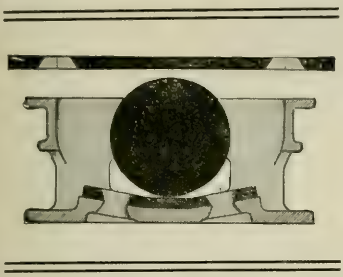

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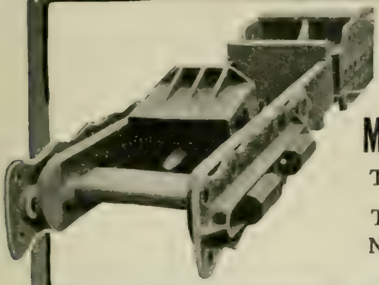

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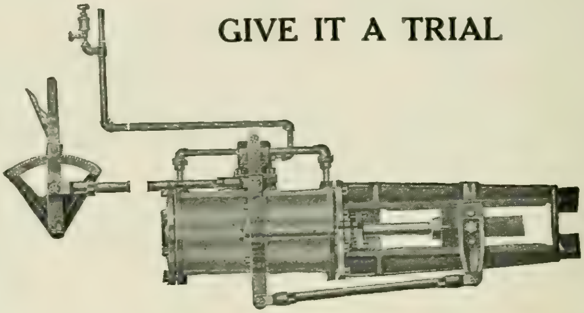

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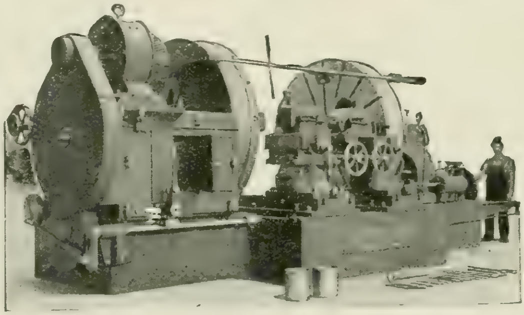

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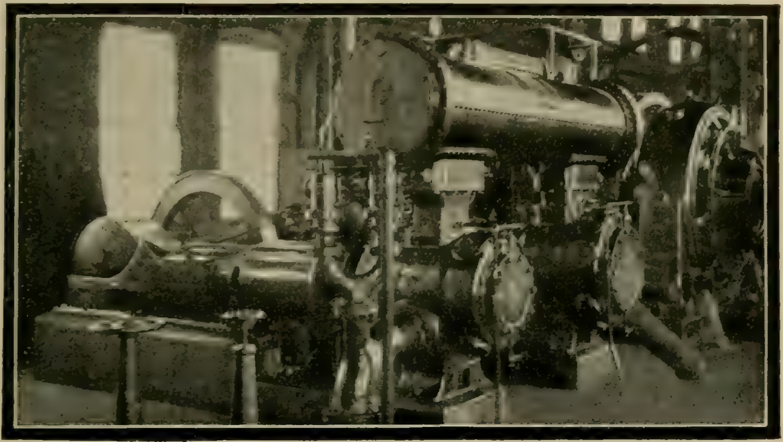

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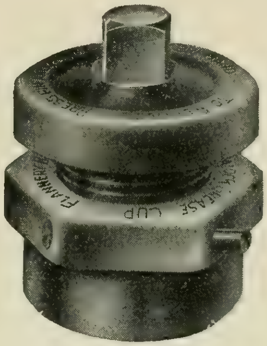

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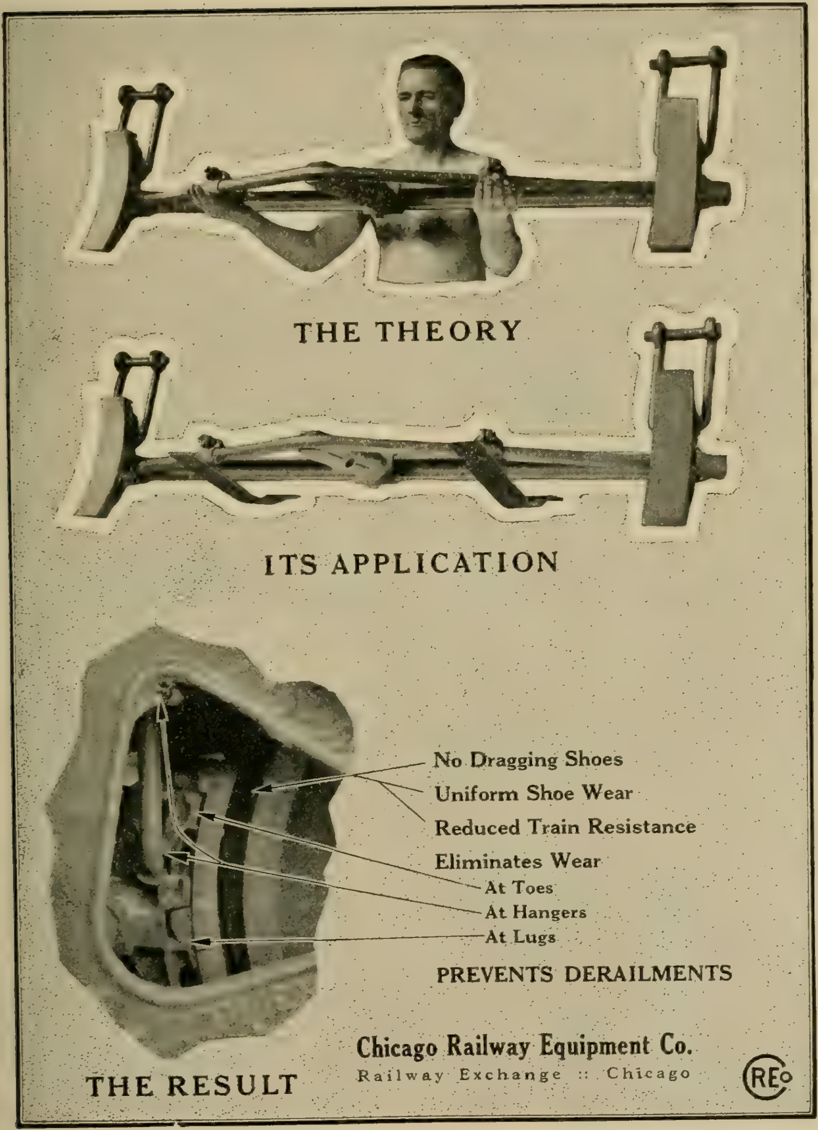
INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	viii
American Brake Shoe & Foundry Co.	iii
American Locomotive Co.	vi
American Steel Foundries	xvii
Baldwin Locomotive Works	viii
Ball Chemical Co.	v
Brady Brass Co.	Front Cover
Chicago Pneumatic Tool Co.	ix
Chicago Railway Equip. Co.	xiii
Davis Brake Beam Co.	i
Dearborn Chemical Co.	iv
Flannery Bolt Co.	x
Fort Pitt Malleable Iron Co.	xi
Galena-Signal Oil Co.	xi
Gould Coupler Co.	ii
Graham Bolt & Nut Co.	Front Cover
Hagan, George J. Co.	Front Cover
Hunt-Spiller Mfg. Corporation	x
Johns-Manville, Inc.	xvi
Johnson Bronze Co.	i
Locomotive Stoker Co.	xv
McConway & Torley Co.	xv
National Malleable and Steel Castings Co.	iv
Niles-Bement-Pond Co.	vi
O'Brien, Martin J., Co., Incorporated	Front Cover
Paxton-Mitchell Co.	iv
Pgh. Testing Laboratory	Front Cover
Pressed Steel Car Co.	xix
The Q. & Co.	ii
Railway Equip't. and Publication Co.	iii
Railway Steel Spring Co.	xvi
Safety Car Heat. & Lighting Co.	xvi
Schaefer Equipment Co.	v
Sipe, James B., & Co.	iv
Southern Wheel Co.	iii
Standard Safety Nut Corp.	Front Cover
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	iii
The Superheater Co.	Front Cover
Suydam, M. B., Co.	Back Cover
The Symington Co.	v
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xviii
U. S. Metallic Packing Co.	xvi
Vapor Car Heating Co., Inc.	xviii
Westinghouse Air Brake Co.	vii
Westinghouse Elec. & Mfg. Co.	vii



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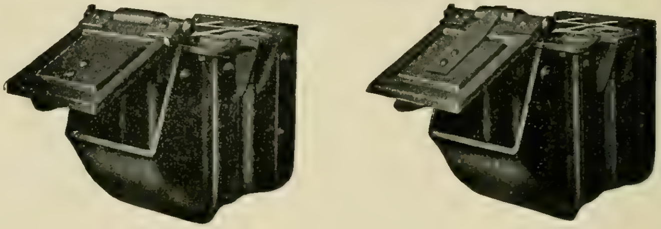

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OF
The Railway Club of Pittsburgh

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Pittsburgh, Pa., Dec. 18, 1924.

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Past Presidents

*J. H. McCONNELL	October, 1901, to October, 1903
L. H. TURNER	November, 1903, to October, 1905
F. H. STARK	November, 1905, to October, 1907
*H. W. WATTS	November, 1907, to April, 1908
D. J. REDDING	November, 1908, to October, 1910
F. R. McFEATTERS	November, 1910, to October, 1912
A. G. MITCHELL	November, 1912, to October, 1914
F. M. McNULTY	November, 1914, to October, 1916
J. G. CODE	November, 1916, to October, 1917
D. M. HOWE	November, 1917, to October, 1918
J. A. SPIELMANN	November, 1918, to October, 1919
H. H. MAXFIELD	November, 1919, to October, 1920
FRANK J. LANAHAN	November, 1920, to October, 1921
SAMUEL LYNN	November, 1921, to October, 1922
D. F. CRAWFORD	November, 1922, to October, 1923
GEORGE D. OGDEN	November, 1923, to October, 1924

*—Deceased.

Meetings held fourth Thursday of each month except June, July and August

PROCEEDINGS OF MEETING

DECEMBER 18, 1924

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., at 8 o'clock p. m., President A. Stucki in the chair.

The following gentlemen registered:

MEMBERS

Abel, A. W.
Adams, W. A.
Anderson, A. E.
Babcock, F. H.
Balzer, C. E.
Bandish, J. M.
Beam, E. J.
Bednar, Joseph J.
Berghane, A. L.
Blakley, T. M.
Boiselle, R.
Brandt, W. L.
Braun, O. F.
Brower, J. E.
Carroll, J. P.
Conway, J. D.
Cooper, J. P.
Cruikshank, J. C.
Cunningham, R. I.
Dambach, C. O.
Davis, Chas. S.
Dierker, K. H.
Edwards, C. H.
Emery, E.
Fagan, R.
Faix, Joseph
Fitzgerald, T.
Freshwater, F. H.
Fults, J. H.
Gibson, D. W.
Goda, P. H.
Greene, W. F.
Harris, John P.
Hansen, Wm. C.
Heinlein, Geo. J.
Hickling, F. G.
Holmes, E. H.
Hood, J. M.
Hoover, J. W.
Hoover, R. C.
Howe, D. M.
Hulick, E. G.
Hyde, W. B.
Johnson, Nelson E.
Jungbluth, Adolph
Kelly, Leo J.
Koch, Felix
Kummer, Jos. H.
Laughlin, R. J.
Laurent, G. F.
Lawson, A. F.
Lehr, Harry W.
Lewis, Herbert
Lohr, Allen W.
Ludgate, B. A.
Lynde, L. E.
Lynn, Samuel
Matchett, H. K.
Mitchell, F. K.
Muir, R. Y.
McLaughlin, H. B.
Obermeier, L. J.
Orchard, Chas.
Painter, Joseph
Parke, F. H.
Patterson, J. E.
Pehrson, Alf. K.
Phillips, W. H.
Posteraro, S. F.
Proft, J. W.
Rabold, W. E.
Renshaw, W. B.
Roberts, J. E.
Rogers, Robert
Saltic, Thos.
Sattley, E. C.
Schrader, A. P.
Schramm, R. L.
Severn, A. B.
Shannon, David E.
Shellenberger, H. M.
Skuce, C. G.

Stewart, L. S.
Stucki, A.
Sutherland, L.
Walter, W. A.
Winell, K. O.

VISITORS

Chase, C. N.
Craig, F. B.
Croasmun, H. O.
Fralic, C. F.
Gee, Geo. H.
Healy, Richard
Jex, W. S.
Jones, D. T.
Jungbluth, H. A.
Kintner, S. M.
Lobez, P. L.
Mahan, W. C.
Manson, A. J.
Meehan, P. J.
Mitchell, W. S.
McDowell, C. G.
McGirk, John D.
Oyde, J. Alex.
Phillips, Frank R.
Purnell, C. S.
Shipe, W. E.
Shook, P. J.
Smith, Sion B.
Spendlit, Rudy
Wetzig, J. M.
White, W. W.

The call of the roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with, as they are to appear in printed form.

The Secretary read the following list of applications for membership:

Bain, Geo. F., Rep., Copperweld Steel Co., Braddock P. O., Rankin, Pa. Recommended by F. K. Mitchell.

Blume, W. A., American Brake Shoe & Foundry Co., 3417 Smallman St., Pittsburgh, Pa. Recommended by V. H. Miessner.

Chase, C. N., Sales Engr., Heavy Traction Div., Rwy. Dept., Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. Recommended by L. E. Lynde.

Cramblitt, Leonard, Supervisor Locomotive Operation, B. & O. R. R., Glenwood, Pittsburgh, Pa. Recommended by J. A. Spielmann.

Depner, Michael, Hammersmith, P. & L. E. R. R., 306 Grove St., McKees Rocks, Pa. Recommended by K. Berg.

Fagan, R., C. C., Glassport Car Shop, P. & L. E. R. R., 801 Vermont Ave., Glassport, Pa. Recommended by Samuel Lynn.

Hankins, F. W., Gen. Supt. M. P., Penna. R. R. System, 5512 Center Ave., Pittsburgh, Pa. Recommended by M. W. Clement.

Kelly, Leo F., Sales Rep., Pittsburgh Screw & Bolt Co., 616 S. Linden Ave., Pittsburgh, Pa.

Kintner, Samuel M., Manager, Research Dept., Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. Recommended by J. D. Conway.

Loch, Leo. J., Stockman, Penna. R. R. System, 2300 Arlington Ave., Pittsburgh, Pa. Recommended by A. W. Abel.

Manson, Arthur J., Mgr., Heavy Traction Div., Railway Dept., Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. Recommended by L. E. Lynde.

Marlow, Geo. A., Chief Car Insp'r, Penna. R. R. System, 522 Penna. Station, Pittsburgh, Pa. Recommended by E. Emery.

Mitchell, W. S., Signal Insp'r, P. & L. E. R. R., 540 First St., Beaver, Pa. Recommended by J. D. Conway.

McQuiston, J. C., Mgr. of Publicity, Westinghouse Companies, East Pittsburgh, Pa. Recommended by J. D. Conway.

Oberlin, A. C., Auditor, Schaefer Equipment Co., 1827 Oliver Bldg., Pittsburgh, Pa. Recommended by J. D. Conway.

Patterson, J. F., Gen. Supt., Penna. R. R. System, Eastern Ohio Div., 225 Penna. Station, Pittsburgh, Pa. Recommended by M. W. Clement.

Stackhouse, R. K., Supt. Stations & Transfers, Penna. R. R. System, 1002 Penna. Station, Pittsburgh, Pa. Recommended by M. W. Clement.

Purnell, C. S., Sales Engr., Heavy Traction Div., Rwy. Dept., Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. Recommended by L. E. Lynde.

Schmied, Fred J., Foreman, Railway Service & Supply Corp'n., 302 Russelwood Ave., McKees Rocks, Pa. Recommended by Samuel Lynn.

Smith, Ralph W., Elec. Engr., Renewal Parts, Westinghouse Elec. & Mfg. Co., 329 Fifth St., Oakmont, Pa. Recommended by L. E. Lynde.

Spindler, Wm. E., Trav. Car Insp'r., P. & L. E. R. R., 226½ Erie St., McKeesport, Pa. Recommended by Samuel Lynn.

Temme, A. E., Foreman, Penna. R. R. System, 1909 Lookout St., Pittsburgh, Pa. Recommended by A. W. Abel.

Whitlock, C. E., Supt., Penna. R. R. System, 109 Monitor Ave., Ben Avon, Pa. Recommended by J. W. Hoover.

PRESIDENT STUCKI: These applications will be referred to the Executive Committee in due course and, upon approval by them, the gentlemen will become members without further action than the payment of one year's dues.

Is there any further business to be brought before the Club at this time? If not, we will proceed to the paper of the evening, on the subject, "The Popularization of Radio," which will be presented by one who knows his subject, Mr. J. C. McQuiston, Manager, Publicity Department, Westinghouse Electric & Manufacturing Company. I take pleasure in introducing to you Mr. McQuiston.

"THE POPULARIZATION OF RADIO"

By J. C. McQuiston, Manager Publicity Department, Westinghouse Electric & Manufacturing Company.

Radio broadcasting today is an art which has an appeal not only to the millions in North America, but also to the peoples in South America, South Africa and Europe. Radio broadcasting news fills pages in our daily newspapers; radio magazines are printed by the score. The radio broadcasting industry represents a business of $400,000,000 per year. Radio broadcasting is a service in which the people of the world today are vitally interested.

It is difficult even for those of us who have been working directly with this wonderful art ever since its start, to realize that a little more than four years ago there was no radio broadcasting; there was no gigantic radio industry; 500 broadcasting stations were not on the air nightly and naturally there was no radio broadcasting public. Except for a very few people directly concerned with the radio industry and, of course, the amateurs, radio men, a class confined almost exclusively to code operators, there were few of what we call the public, interested in any form of radio.

So this great public service which we now call broadcasting has grown from nothing, one might say, to a huge industry whose ramifications extend to all parts of the world in four years. A short time for anything to achieve such a success. There was vision behind the start of broadcasting, however, which more than anything else is responsible for its world-wide popularity. Radio broadcasting at the very first was conceived as a great public service and because the ideals of that service have been kept constantly as the goal of broadcasting, it has grown in popularity until today it is an indispensable thing.

It is interesting to pause a moment and reflect that without vision there is no progress. All great developments start as an idea in some far-seeing person's mind. All great developments are carried through to their logical conclusions because of the vision of the pioneer. Pittsburgh is known to all the world as THE industrial center. When one thinks of the pioneers in various lines of endeavor in Pittsburgh who had the vision to foresee things one is amazed. There was Andrew Carnegie, who foresaw the future of steel and prepared the way for it. His name is deathless as the Steel King. There was Dr. John Brashear, a pioneer in astronomy, who gave to the world a perfected lens. When one thinks of coke, the name of that pioneer, H. C. Frick, comes to mind. George Westinghouse, a great man with a tremendous vision, gave to the world the airbrake, the utilization of natural gas, and the perfection of electrical machinery. In the field of food preparation, H. J. Heinz stands supreme. Pittsburgh's pioneer in the glass industry was MacBeth, who perfected lamp chimneys and lamp lenses. Pittsburgh even had a pioneer in radio, Dr. Reginald Fessenden, who, in the 90's, conducted experiments in radio and invented the coherer while serving as an instructor in the Western University of Pennsylvania, now the University of Pittsburgh.

Thus we find that with the development of any industry there must be vision. All of the great men just named above had vision. They foresaw. They were responsible for the growth of Pittsburgh, and because of their vision and the fruits of that vision, Pittsburgh today occupies its present proud position unique among cities in the world. Radio broadcasting was started with the same degree of vision.

During the World War, the Westinghouse Company operated at the home of Frank Conrad, now assistant engineer of the company, in Wilkinsburg, a broadcasting station, principally to test apparatus which was being perfected for the armies of the Allies and of the United States. On Saturday nights, for years, Mr. Conrad broadcasted concerts. Sometimes these concerts consisted of phonograph records; at other times a talk by Mr. Conrad was given and again the broadcasting of music by singers was tried. This broadcasting was conducted not on schedule, but somewhat intermittently. Of course, the audience consisted of a few amateurs and some fellow-experimenters who, with Mr. Conrad, were interested in the science of radio.

This test work continued until the fall of the year 1920. Vice President H. P. Davis, of the Westinghouse Company, had foreseen that radio broadcasting had possibilities of being the greatest public service ever devised. Accordingly, he called a conference asking that Mr. Conrad and I talk over with him the future, if any, of radio broadcasting. From that conference grew radio broadcasting, because it was there decided to start KDKA, the world's pioneer.

In that conference Mr. Davis established that radio broadcasting, if it should have the popular appeal, should be continued regularly on a daily scheduled basis with the public constantly informed regarding programs and that radio broadcasting should work directly with the public prints.

It was accordingly directed that the Westinghouse transmitting equipment be moved from the home of Mr. Conrad, in Wilkinsburg, to the Westinghouse Works at East Pittsburgh.

After some further tests the first program was transmitted November 2, 1920. This vital program consisted of reading the election returns of the Harding-Cox election from information given us by the Pittsburgh Post; which, by the way, is the pioneer radio newspaper of the world.

Just a few people heard that pioneer program. One group gathered in the Edgewood Club, under the leadership of L. W. Chubb, manager of the Westinghouse radio engineering department, to hear the election returns. This group is given credit for being the first club group in the world to hear a broadcast program, scheduled in advance.

Broadcasting at KDKA was established on the basis of a regular daily service, scheduled in advance and with the public informed by publication in the newspapers of programs. It is to the credit of the newspapers that they gave their whole-heartd support to radio from the start. The Pittsburgh Post and the Sun were the first newspapers to print radio programs, now a universal practice of newspapers.

From this beginning grew radio broadcasting, a growth so astounding that it is one of the wonders of the twentieth century.

However, with the start of KDKA, our cares also began. It was necessary for us to pioneer in radio program work, not only to obtain programs that would satisfy the public, but to also improve the station, so that it could service an increasing number of listeners.

In the early days there was no radio studio. There was only a microphone in the operating room, and the artists and announcer talked into this pickup, located in the same room as the broadcasting equipment.

The next move was the installation of a studio separated from the station, where the artist could perform without the distractions of the transmitting equipment and the operator. Then it was discovered that studios required draping to deaden the effects of echoes. Thus started the practice of lining studios with monk cloth.

Another pioneering step was the location of studios at remote points from the station in order that artists might not have to come to the vicinity of the station to broadcast but that they might have a convenient and centrally located site from which to perform. This remote studio pick-up development has resulted in KDKA having four studios today, one at East Pittsburgh; one at the National Stockman and Farmer offices in East Liberty, another at the University of Pittsburgh in Oakland, and still another in the Pittsburgh Post building in downtown, Pittsburgh.

Another pioneering innovation was the establishing of microphones in pick-up points so that programs could be conveyed from churches, auditoriums, public halls, theaters, and other places where public or private performances took place.

The pioneer installation of these outside pick-ups was in the Calvary Episcopal church from which was transmitted the first radio church services in the world, January 2, 1921, with the Rev. Edwin J. van Etten, officiating. Other installations were made in theaters and on May 9, 1921, from the Davis Theater the first theatrical broadcasting took place. Further installations were made so that today KDKA has 42 outside pick-up points from which to choose programs.

Other innovations which were made in these early days was the broadcasting of Arlington time signals, broadcasting of athletic contests from Forbes field and performances from the various music halls.

In an endeavor to improve the quality of music broadcast, the KDKA Little Symphony Orchestra was organized under the direction of Victor Saudek. It became the first radio musical organization, and he became the first radio impressario. The Westinghouse Band and the Westinghouse Community Chorus are today familiar to thousands of radio listeners.

KDKA pioneered in the broadcasting of police messages, such as details concerning stolen cars, missing persons, wanted criminals and escaped convicts. The Pittsburgh Department of Police has continuously used the pioneer station for various kinds of work.

To see that nothing might go out on the radio that might offend, a duel system of program checking was perfected, one check being made prior to the appearance of the material on KDKA's program and the other a system of field checking, whereby every program transmitted from KDKA was heard on a radio receiver and a careful report made, which was in effect the same as a criticism of stage plays. This field report is today made by Miss Marhorie Stewart, a blind girl, whose education and training have fitted her for such work.

Announcers are carefully trained in their functions. An announcement before being spoken into the microphone is first read to a literary critic who corrects any faults in grammar or pronunciation and even style so that KDKA's announcements may be as perfect as possible.

All this work insures that radio programs are transmitted as perfectly as possible and will have the greatest possible appeal to the public.

One of the reasons for the universal appeal of radio broadcasting is in the fact that it has been largely free from advertising messages. It is the general opinion of all that advertising has no place in the broadcasting program. Advertising in the programs makes them offensive to the public and harms the appeal of the station. From the first, KDKA has carefully refrained from the broadcasting of anything that might savor of advertising. However, the publicity that might accrue to any person or concern broadcasting is perfectly legitimate and is due those who have bent their efforts to the servicing of the radio public.

In two great fields radio broadcasting has taken a leading part. I refer to religion and to education.

In introducing religious services, KDKA was the pioneer and is still the leader. It broadcasted the first church service ever to go out into the ether and at this time, broadcasts the services of 10 churches who alternate their time. It is the consensus of opinion that the broadcasting of religious services is one of the things that have been indispensible in the popularization of radio.

To assist in the furthering of educational talks and course, a studio was established on the campus of the University of Pittsburgh from which is regularly conducted a course in general formation, one of the things which makes radio so indispensible today. From this studio lecturers, who are professors of the university, deliver educational courses which are for the benefit of those radio listeners who desire to take part. A similar course is conducted from Station WBZ, KDKA's sister station, located in Springfield, Mass., and at KYW in Chicago, Ill.

On the farm today, radio broadcasting is a necessity. KDKA early recognized the necessity of a farm program that would hold an appeal for those living in the isolated sections and for that purpose established a studio in the offices of the National Stockman & Farmer at East Liberty. From this studio are transmitted nightly the stock and market reports which the farmer today finds so indispensable to his daily business. From here also are transmitted talks concerning every subject with which the farmer is familiar—the talks being given by experts from such institutions as the Pennsylvania State College, the Pennsylvania State Grange and other organizations for and of the farmer. This studio is a source of information to the farmer which keeps him abreast of the times.

During the progress of broadcasting there has been developed a system of short wave repeating. This system was conceived and developed by the same pioneer who operated the first Westinghouse station, Mr. Frank Conrad. This system of short wave repeating is responsible for our International broadcasting work. Short waves transmitted by KDKA may be picked up and repeated by another station, thus a program originating in Pittsburgh may be broadcast simultaneously by a number of stations. To further this work station KFKX was established at Hastings, Neb., to serve as KDKA's repeater station and thus boost KDKA's waves to all parts of America.

A pick-up station was also established in the factory of the Metropolitan-Vickers Company in Manchester, England to receive these short wave signals of KDKA and also repeat them. By this system, KDKA transmitted the first International concert in 1923, when on December 31 of that year, Vice-President Davis transmitted the first radio greeting from America ever sent the British Isles. The message was picked up at Manchester and repeated by all the stations operated by the British Broadcasting Company. A man with a crystal set in England today can hear a concert which originates in the United States.

In the past year there has been a wonderful growth to this short wave repeating. In addition to England we have given service to South America repeatedly with radio programs. The latest marvel is news that Station JB, located in Johannesburg, South Africa, picked up and repeated a KDKA program so that those living in the Transvaal, could hear a radio program originating in Pittsburgh, 8,500 miles away.

With this International aspect to radio, we have a powerful agency for universal peace. The peoples of the various International countries are linked together closer than ever before. They can hear the United States nightly and ere long we will be able to hear them with the same ease. A daily international exchange of thought is a possibility of the near future. Our statesmen and visionary men are of the opinion that with such an international radio linking there will be less chance for the misunderstandings of the past which have been so unfortunate to the world. A universal system of communication is undoubtedly a great forward stride towards world peace.

What will be the future of radio? No one can foretell. Certainly we are working towards internationalism in broadcasting. We can foresee a future radio system whereby the programs of the art centers of the world will be available to the radio listener as today he receives the programs of his local station. We can foretell that in the coming years, the world centers such as Paris, London, Rome, Tokio, New York will furnish radio programs which will be interchangeable and that the man with a radio set will have his pulse upon the world movements. This will come and may come soon. We have been promised radio motion pictures and these, too, will add to the universal appeal of the radio.

This great wonderful science holds infinite possibilities to be of service to the world. We can only hope that its service will be continually directed in the right channels so that it may be of the utmost benefit to humanity.

PRESIDENT STUCKI: This is indeed a great subject. While I would not argue the question whether the world is flat or round, I would like to know a little more about that low wave business. Can you tell us, Mr. Kintner:

DR. SAMUEL M. KINTNER: (Research Department Radio Corporation of America.) Mr. President and Fellow Members: I do not know whether I may say Fellow Members or not. I have been proposed and I do not know whether I have been accepted or not. I will risk it.

I do not know what a low wave is myself. I do not know what Mr. McQuiston means by a low wave, unless he means a low frequency or short wave. The only difference between a short wave and a long wave is the same difference as between a short string and a long string, the only difference is a difference in length in the distance between the crests of two consecutive waves. We find by experience in radio broadcasting that short waves travel farther with less interference and are more reliable and effective than long ones. We do not know why, we simply know it as a matter of experience. We can get messages from East Pittsburgh to South Africa with about 10 k. w. that are difficult to transmit on a long wave a quarter that distance with twice that amount of energy. Nobody knows the reason for that difference. We know that a larger proportion of the energy delivered to the antenna system is radiated with short waves than with long waves. That is simply a fact known from experience.

There is the other advantage also in the shorter wave in that it is much freer from atmospheric disturbances, and atmospheric disturbance is today our greatest bugbear in radio and anything that will tend to relieve atmospheric disturbance will of course tend to improve the kind of service we can expect.

Short waves have made a very pronounced impression on the radio world within the past year or so, and their employment generally has been the most marked advance within that period. As to how much farther we can go in short waves, no one knows. We are making efforts to go to shorter and shorter waves. Our normal wave length is 326 meters at KDKA. Our short wave length is 64 meters. We have succeeded experimentally in getting as low as 20 meters with smaller amounts of power. And strange as it may seem, we have received messages on the third harmonic, practically, 20 meters, on the 64 meter wave with the same intensity of signal at Hastings, Neb., with one-tenth the energy that we use on the fundamental wave. So you can see the possibilities of still more and more gain as we shorten the wave length and increase the frequency.

There is also the possibility as we get shorter and shorter waves of bringing in directional reflection effects and directing the radiations more strongly in one direction than in another. When we can accomplish that, you can see that it will be possible to establish definite channels between certain points, which can be duplicated a number of times as long as those channels do not get into each other's line, and that will increase very materially the number of available channels for signaling possibilities.

Still another advantage in the short waves is that the separation of channels is determined largely by the difference in frequency of the waves, and as we go to those enormous frequencies, it only requires a channel of approximately 10,000 cycles to constitute a channel of communication, the number of available channels is increased enormously and we get into the thousands, whereas at the present we are limited in our Class B broadcasting to 66. And I believe I can see the future of industrial houses with the main and branch offices connected by means of radio communication and making that a very effective and economical means of transmission of their intelligence between these two particular points. As I see it our greatest line of development is the short wave system. It is new and there is a lot to be learned about it, just as there is a lot to be learned about the other.

There is very little that can be said on the technical side of radio today without the hazard of repeating what is commonplace and published every day in the papers. Therefore, I shall not attempt anything of that kind. But I do want to touch on one or two things not emphasized in Mr. McQuiston's very interesting talk and just indicate some of the things that will develop along these lines.

The speaker referred to the necessity of selecting people because of their quality of voice and for their ability to be heard distinctly over the radio. There is a factor there that we do not quite appreciate, two indeed. The first is the defects in the apparatus, both at the "picking up" point and at the reproducing point, which fails to carry fully the intonation and the quality of the speaker's voice to the listener. The other is this: We fail to appreciate how much we depend upon watching the speaker's lips to get a clearer understanding of what he says. As I see the radio of the future there is the possibility of seeing the speaker as well as hearing him. I can visualize methods that will make it possible to transmit something of service to the eye as well as to the ear. All we need to do to accomplish that is to provide suitable means to properly modulate the transmissing carrier wave in a pattern which will conform to the picture you desire to send. When we send music we may modulate it to conform to variations in the musical intensities. When we send a picture we may have to modulate it to conform to variations in light intensity. There are systems at present for sending by radio, still pictures even across the Atlantic. You would be surprised at the accuracy of those pictures. They can scarcely be told from a contact print from a negative. Those pictures, both the still and moving ones, are all substantially the same in principle, and it simply means increased speed to make the moving picture a reality. At present we send a still picture in approximately six minutes. It is necessary to cover the entire surface of the picture with a series of lines, just as you used to put a piece of paper over a coin and draw a set of lines with a lead pencil over the paper and see the image come out. In the same way we draw a pencil of light over an image and impress a photo-electric cell which is more or less conducting for electric current according to the intensity of the light that is focused upon it. As we do that we convert a light image into an electric current image. We amplify that image, transmit it by a carrier wave and pick it up at the receiving end just as we do the carrier wave for sound reproduction and then we use the incoming signals to control some form of light source which is synchronized with the "pick-up" machine so that the same part of the image, to be reproduced, is being treated simultaneously. Thus the variations in intensity of spots of light as the light pencil moves over a photograph film, and we get a photograph print of the object being transmitted. If it is done with a rapidity of sixteen times per second the persistence of vision of the eye will carry it along and you will see a continuous picture. This system has been perfected so that I have seen my own hand projected so that I would recognize the movement of different fingers and the outlines of the fingers as I saw them reproduced on another screen in the same room with a reasonable degree of accuracy.

That point is a thing I would like to impress upon you tonight, that our need of careful speakers will be minimized when we are able to see as well as to hear the speaker.

PRESIDENT STUCKI: Mr. Fitzgerald, General Manager of the Pittsburgh Railways Company, is here, and I wonder if he will add anything.

MR. T. FITZGERALD: Why don't you ask me something easy? This subject has been splendidly handled and there is nothing that I can add.

I am with the Pittsburgh Railways Company, and have for some time been studying street railway problems. When Mr. Thompson started to take the railways out of the hands of the receivers and rehabilitate them, Mr. McQuiston became one of the most potent factors in helping us put over the reorganization of the railways company. All of his organization and in fact the entire Westinghouse organization gave freely of their time and effort in assisting Mr. Thompson. You can get some idea of the value of that help from this splendid story of the work he has done which you have just heard him tell this evening. We hope we will have the same vision with reference to the railways which Mr. McQuiston and his group have with reference to the radio. We hope that with the development of the railways and the help of the public we will be able to make this community, which is small with comparison with the community which Mr. McQuiston serves with his radio, a better place in which to live. We hope to be able to reduce our fares ultimately, not as you probably would think at first blush, but by selling the empty seats which we have at present at a price people will be able and willing to pay and in that way promote inter-communication between different sections of our community.

I do not know what more to say about our problem. I hope at some future time to be able to tell you in detail what we are doing and trying to do. I might say this, however, to demonstrate the help that we have received from our friends in the Pittsburgh district, that in the last depression, in spite of adverse weather conditions, our traffic fell off only one-half as much as compared with 1923 as it had in the depression of 1921 as compared with 1920, and I believe the 1924 depression was as serious a depression as that of 1921.

I did not expect to be called on. I thoroughly appreciate the opportunity, however, and I hope at some time to be able to present to you our problems with a view to securing your understanding and help in working them out.

QUESTION: I am not a radio expert but a radio fan who has spent many nights between eleven and two listening to something. I understood the speaker to say that programs which have been broadcasted by KDKA have been picked up by English stations and relayed. I have wondered why some of the European concerts have not been relayed over here. We do not hear anything but static. When we had the radio week for European broadcasting all I could hear was static.

MR. McQUISTON: Two things probably prevent that as much as anything else. Until recently England has not been very powerful and I will say somewhat backward in their broadcasting. They have not had the equipment over there that we have here. Then there is a difference in time which makes it difficult for them to broadcast when we could get it here. There are five hours' difference. Some of the fans do not mind staying up that much later, of course, but others do. I have no doubt that later on there will be more relaying of English concerts in this country.

PRESIDENT STUCKI: Can we hear from Mr. Manson?

MR. A. J. MANSON: This is indeed a treat. I have just come to Pittsburgh. I had the pleasure of starting in here with the Westinghouse Company about twenty years ago. Then I left and went east and now I am back again, and I am looking forward with a great deal of pleasure to renewing my associations back here again. I will not risk making a speech, but I thank you for your courtesy in calling on me.

MR. J. D. CONWAY: We have all enjoyed this discussion very much. Yet, I am somewhat mystified and a good deal surprised at one apparent, almost flagrant, omission by Mr. McQuiston. He did not connect radio up with cross word puzzles.

QUESTION: I would like to ask about the facial expression and the action shown in the film of speakers broadcasting, whether it is customary for speakers to act out the sentiment of the speech before the microphone?

MR. McQUISTON: You can never keep a Jew from working his hands. We had some actors in the early days who got stage fright when they got in front of a microphone. I remember one very well who did not say what he intended to at all. He just told the truth. He looked into it and said: "Unseen audience, wherever you are, I tell you as I look into this microphone, it looks like a tremendous affair and I will admit to you that I am scared stiff." We have had singers come before the microphone and simply give it up and could not sing. We have had violinists who would not go back, nervous wrecks. Not many of them fail to perform now.

MR. LYNDE: Can you tell us what success has been had in receiving radio messages on moving trains?

MR. McQUISTON: They have had some success in that direction. We are doing some experimental work on the C. M. & St. P., and one train on the D., L. & W. is receiving messages very clearly and distinctly. The difficulty is that some of those railroads are trying to use loud speakers, and the loud speaker amplifies the noises and the static and everything else and that makes reception very unsatisfactory. I think the way to receive messages on a train is with ear receivers so that you get the message individually and are not bothered with the magnified static and other outside noises. Experiments are going on with that right along. I believe, however, that it will be necessary to use ear receivers and not attempt to entertain everybody in the Club car.

MR. A. E. ANDERSON: This has been a very interesting evening, particularly so to me, for it has been my hobby for a long time that we should have the history reproduce a record of everything that develops and goes on from its beginning. Mr. Mc-

Quiston has given us an interesting history of how radio broadcasting has been developed, which will make the report of this meeting a valuable record for future historians and the Program committee could well give Mr. McQuiston a place each year. And also, we have the return of our friend, Mr. Kintner, and from the additional information he has gained since he spoke to us before, I wonder if he can answer a question I asked him at that time, and that is, what is it?

There are two or three questions I would like to ask. First, may there not be some unfairness to those performers who are rejected by your critic, through their unfamiliarity and also the defects in the apparatus which have been spoken of, and might they not make good on a second trial? Another one has been touched on in reference to possible visual as well as auditory transmission. The comments of newspaper men on Mr. Baker's speech before the Democratic National Convention in favor of the League of Nations resolution, were that it was one of the best addresses he had ever made; and yet, as it came over the radio, it was generally thought to be very mechanical. May that not have been due to the lack of ability to visualize the speaker, to which Mr. Kintner referred?

Then the speaker referred to radio transmission down into mines below the surface of the earth. How is this wave carried? Does it go through the air, or can it be transmitted through the earth and thus avoid atmospheric disturbances?

In appreciation of what we have listened to, I wish to present at this time, to be acted upon at the close of the discussion, a motion for a vote of thinks to Mr. McQuiston and Mr. Kintner in appreciation of their papers and talks.

MR. McQUISTON: As to possible injustice done to some of the artists, now I think our musical director and those who have studied the work are pretty well able to determine whether these performers could do better later on. We have had occasions where we have recognized that performers were not at their best. With improved apparatus it is entirely possible that some who were failures will come back and make a distinct success later on.

As to keeping in touch with the public, it is perfectly wonderful how they keep us informed. We like to get letters of criticism fully as much as letters of commendation. Of course, the public does not understand our problems. We do not expect them to. Nevertheless we are glad to get all the reaction we can from the public. If we did not get letters and telegrams, we would feel that it was a pretty dead issue. It is not at all uncommon to get 250 telegrams in an evening. We have had as many as 25 long distance telephone calls in an hour's performance. The night Mr. Bryan spoke in the Point Breeze Church we received more than 4,000 letters and telegrams.

As to the gestures while speaking, I think some speakers lose a great deal when they speak over the radio; they are the kind of men who have personal magnetism. So far, radio does not transmit that. With some men the most of their speech is action. Yet we have only to hear President Coolidge over the radio to recognize a wonderful voice. Anybody could listen to him over the radio. And to those who want information, it is possible that we get more out of it than we would if we read it or listened to the man speaking, when we are concentrated and not distracted by action on the stage or hats in front of us or noises outside.

The last question I will ask Mr. Kintner to answer.

MR. KINTNER: Regarding the change in Secretary Baker's speech in reproduction from what it was in the hall, there is no doubt of it and we must admit the imperfections of our loud speakers. The remarkable feature is that it is as good as it is, when you think of that little bit of sheet iron jumping around to reproduce all the sounds of an orchestra at one time. When that iron diaphragm is in an ear piece the accuracy of reproduction is very much better than in a loud speaker. But even the loud speaker is by no means a forlorn hope. We have at present a development in a loud speaker which produces the voice just as though the speaker were in the room. You get every little variation in intonation or enunciation. That is a development that is to come in a comparatively short time. I regret to say it is not with us yet. So that without question as you hear a speaker reproduced on the loud speaker there is a change in the quality of the voice. You are compelled to amplify so much and there is so much opportunity for distortion.

As to what radio is and why we don't know more about it, I do not know that I can answer any better than I did before. I do not believe the questioner marvels at all as to why the street cars run. Yet it is as difficult to explain as this question he has asked me. He does not marvel at all about the force of gravitation, or that there is light all around us here, and we do not know what it is. We have simply become accustomed to our ignorance, and that is about the only answer I can give him.

MR. SAMUEL LYNN: As there seems to be no further discussion, I wish to take this opportunity to second Mr. Anderson's motion for a vote of thanks to the speakers.

The motion prevailed by unanimous rising vote. There being no further business, upon motion, the meeting adjourned.

J. D. CONWAY, Secretary.

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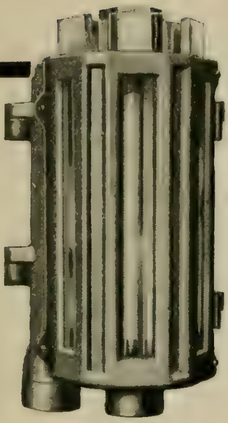

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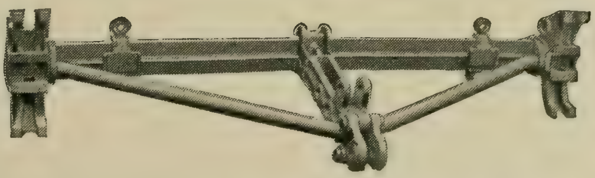

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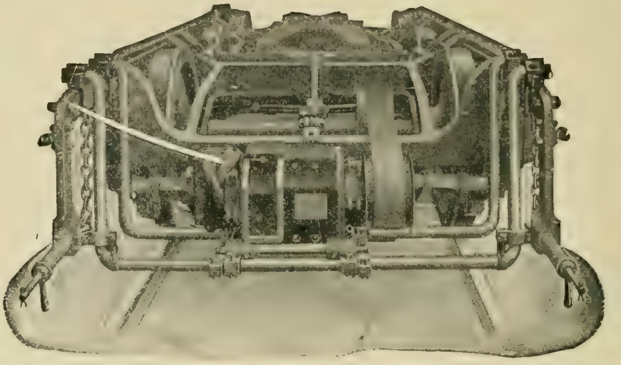

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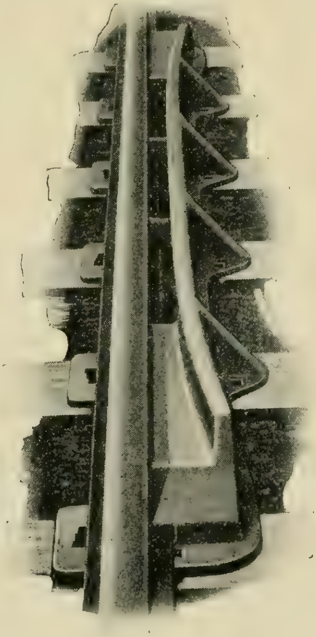

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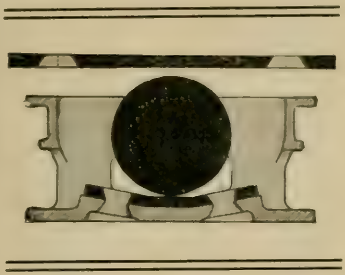

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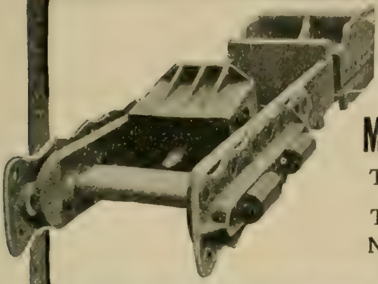

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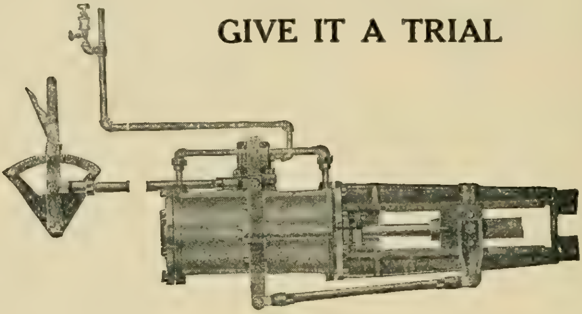

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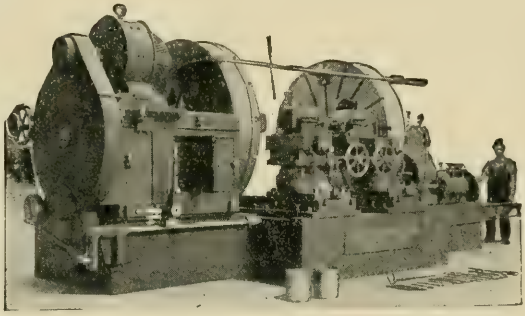

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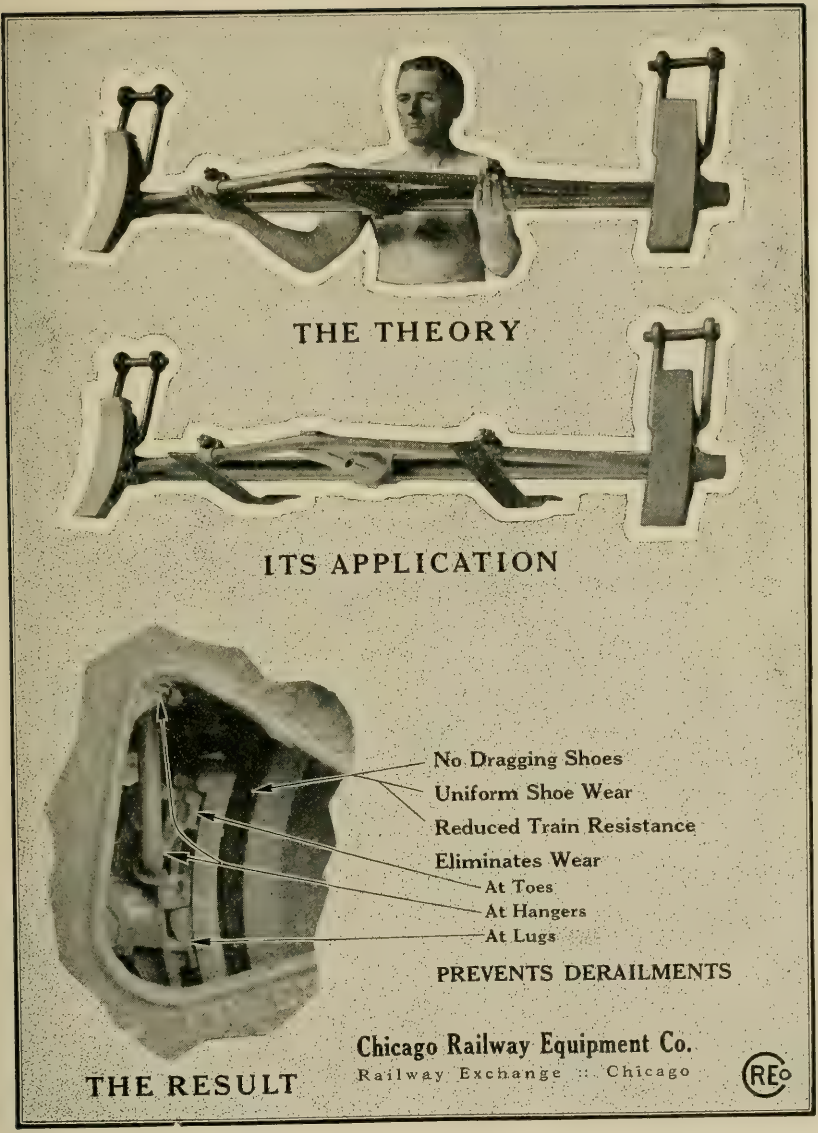
INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	viii
American Brake Shoe & Foundry Co.	iii
American Locomotive Co.	vi
American Steel Foundries	xvii
Baldwin Locomotive Works	viii
Ball Chemical Co.	v
The Bradford Corporation	ix
Brady Brass Co.	Front Cover
Chicago Railway Equip. Co.	xiii
Davis Brake Beam Co.	i
Dearborn Chemical Co.	iv
Flannery Bolt Co.	x
Fort Pitt Malleable Iron Co.	xi
Galena-Signal Oil Co.	xi
Gould Coupler Co.	ii
Graham Bolt & Nut Co.	Front Cover
Hagan, George J. Co.	Front Cover
Hunt-Spiller Mfg. Corporation	x
Johns-Manville, Inc.	xvi
Johnson Bronze Co.	i
Locomotive Stoker Co.	xv
McConway & Torley Co.	xv
National Malleable and Steel Castings Co.	iv
Niles-Bement-Pond Co.	vi
O'Brien, Martin J., Co., Incorporated	Front Cover
Paxton-Mitchell Co.	iv
Pgh. Testing Laboratory	Front Cover
Pressed Steel Car Co.	xix
The Q. & Co.	ii
Railway Equip't. and Publication Co.	iii
Railway Steel Spring Co.	xvi
Safety Car Heat. & Lighting Co.	xvi
Schaefer Equipment Co.	v
Sipe, James B., & Co.	iv
Southern Wheel Co.	iii
Standard Safety Nut Corp.	Front Cover
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	iii
The Superheater Co.	Front Cover
Suydam, M. B., Co.	Back Cover
The Symington Co.	v
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xviii
U. S. Metallic Packing Co.	xvi
Vapor Car Heating Co., Inc.	xviii
Westinghouse Air Brake Co.	vii
Westinghouse Elec. & Mfg. Co.	vii



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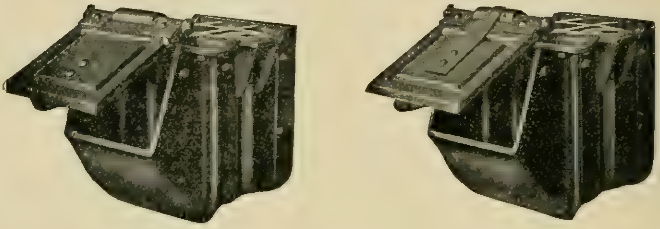

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No. 3

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*—Deceased.

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Weaverling, C. J.
Wheatley, William
Wildin, George W.
Wilkinson, F. C.
Williams, Ernest V.
Winell, Karl O.
Wilson, Henry J.
Wright, John B.

VISITORS

Beiter, Julius
Bennett, T. W.
Braun, Charles R.
Buel, R. S.
Burrhus, Harry L.
Champion, James H.
Chaplin, C. A.
Davis, Wm. B.
Dierker, T. N.
Eisenbeis, W. R.
Farlow, G. B.
Ferris, R. F.
Gailey, A. F.
Gangloff, F. C.
Gould, L. R.
Hanna, R. A.
Harrison, James
Hood, C. E.
Hopper, D. E.
Jungbluth, Herbert A.
Karns, C. A.
Leheny, R. F.
Lesher, B. E.
Lewis, S. B.
Lunk, Charles W.
Mahan, W. C.
Mann, N. T.
Marrison, R. C.
Maxwell, W. J.
Miles, C. B.
McGarrigle, Joseph J.
McKibbon, E. E.
Palmer, E. A.
Phillips, F. R.
Pronikovsky, M.
Reeve, Fred J.
Rice, A. G.
Rodgers, P. H.
Rohyans, A. V.
Shepard, F. H.
Car-Skaden, W.
Smith, C.
Tate, Paul R.
Towle, N. C.
Voltz, G. R.
Wilson, E. C.
Woodling, George V.

The call of the roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with, as they are to appear in printed form.

The Secretary read the following list of applications for membership:

Adams, F. W., Local Storekeeper, B. & O. R. R. Co., Watson Street, Hays, Pa. Recommended by J. A. Spielmann.

Bingham, Sr., George H., Painter Foreman, Mon. Conn. R. R., 4166 Second Ave., Pittsburgh, Pa. Recommended by C. M. White.

Brosius, E. E., President, Official Railway Guide Publishing Co., 304 Fitzsimons Bldg., Pittsburgh, Pa. Recommended by D. M. Howe.

Collins, William, Fore. Car Repairs, Mon. Conn. R. R., 329 Elizabeth St., Pittsburgh, Pa. Recommended by C. M. White.

Davis, C. E., Dist. Mgr. Pgh. Dist., W. L. Brubaker & Bros. Co., 7311 Ferdinand St., Homewood, Pittsburgh, Pa. Recommended by C. M. White.

Edsall, Stanley D., Salesman, Air Reduction Sales Co., 312 East End Ave., Pittsburgh, Pa. Recommended by W. B. Moir.

Fritz, A. A., Clerk, Mon. Conn. R. R. Co., 2713 Sumner St., S. S., Pittsbugh, Pa. Recommended by C M. White.

Farrell, G. R., Representative, National Malleable & Steel Castings Co., 1453 W. 116th St., Cleveland, O. Recommended by C. M. White.

Greaves, G. C., Sec'y to Dist. Master Mechanic, B. & O. R. R. Co., Glenwood Shops, Pittsburgh, Pa. Recommended by J. A. Spielmann.

Herrold, A. E., M. M. and M. C. B., Mon. Conn. R. R. Co., 3915 Winterburn Ave., Pittsburgh, Pa. Recommended by C. M. White.

Hodges, Augustus H., Dist. Master Mechanic, B. & O. R. R. Co., Glenwood Shops, Pittsburgh, Pa. Recommended by J. A. Spielmann.

Joyce, Stephen F., Boilermaker Foreman, Mon. Conn. R. R. Co., 4014 Lydia St., Pittsburgh, Pa. Recommended by C. M. White.

Johnson, H. M., Asst. R. F. of Engines, P. & L. E. R. R. Co., 703 Walbridge St., W. E., Pittsburgh, Pa. Recommended by H. B. Kelly.

Kunkel, Harry C., Scaleman, Mon. Conn. R. R. Co., 4166 Second Ave., Pittsburgh, Pa. Recommended by C. M. White.

Kennelly, Daniel F., Mach. Shop Fore., Mon. Conn. R. R. Co., 4166 Second Ave., Pittsburgh, Pa. Recommended by C. M. White.

Lawson, Albert T., Efficiency Engineer Mon. Conn. R. R. Co., 1606 Dewey Ave., Carrick, Pittsburgh, Pa. Recommended by C. M. White.

Loughner, George D., Dist. Sales Mgr., Pgh. Dist., Carbo-Oxygen Co., 902 Benedum-Trees Bldg., Pittsburgh, Pa. Recommended by C. W. Langhorst.

Maloney, J. Joseph, Elec. Engr., Mon. Conn. R. R. Co., 4166 Second Ave., Pittsburgh, Pa. Recommended by C. M. White.

McGarrigle, Joseph J., Sales Engr., Clark Car Co., 1619 Oliver Bldg., Pittsburgh, Pa. Recommended by H. E. Chilcoat.

McClintock, Glenn, President, Osceola Silica and Fire Brick Co., Oliver Bldg., Pittsburgh, Pa. Recommended by D. J. Redding.

Mann, Nelson T., Com. Engr., Westinghouse Air Brake Co., 353 Marguerite Ave., Wilmerding, Pa. Recommended by A. W. Lohr.

O'Neill, Thomas J., Mach. Fore., Mon. Conn. R. R. Co., 1704 Joseph St., Carrick, Pittsburgh, Pa. Recommended By C. M. White.

Pickels, H. D., Fore. of Car Inspectors, Mon. Conn. R. R. Co., 1500 Fallowfield Ave., Pittsburgh, Pa. Recommended by C. M. White.

Penn, William, Clerk, Mon. Conn. R. R. Co., 2119 Sidney St., S. S., Pittsburgh, Pa. Recommended by C. M. White.

Ryan, William F., Car Fore., Union Railroad Co., 8 Exeter St., Pittsburgh, Pa. Recommended by A. F. Coulter.

Rush, Benj. H., Material Supervisor, B. & O. R. R. Co., 4736 Lytle St., Hazelwood, Pittsburgh, Pa. Recommended by J. A. Spielmann.

Roberts, S. S., Salesman, Pgh. Dist., Carbo-Oxygen Co., 902 Benedum-Trees Bldg., Pittsburgh, Pa. Recommended by C. W. Langhorst.

Spangler, Chas. P., Carpenter Fore., Mon. Conn. R. R. Co., 4166 Second Ave., Pittsburgh, Pa. Recommended by C. M. White.

Tucker, James W., Asst. S. K., B. & O. R. R., 227 Renova St., Pittsburgh, Pa. Recommended by J. A. Spielmann .

Venning, J. C., Coal Trf. Mgr., Penna. R. R. System, 802 Pennsylvania Station, Pittsburgh, Pa. Recommended by C. P. Schrecongost.

Ward, Sr., John, Blacksmith Fore., Mon. Conn. R. R. Co., 4166 Second Ave., Pittsburgh, Pa. Recommended by C. M. White.

PRESIDENT: As soon as these applications have been approved by the Executive Committee, the gentlemen will become members upon payment of the year's dues.

Announcement was made of the deaths of:

Kaiser, Robert, Foreman, Penna. R. R. System, died June 10, 1924.

Riddile, F. C., Gen. Mgr., Edgewater Steel Co., died December 28, 1924.

PRESIDENT: Appropriate memorial will appear in the official proceedings of the club. If there is no further business, the next order will be the presentation of the paper by Mr. Fitzgerald.

It must be gratifying to the speaker of the evening to look over this crowd. It shows not only that the subject is a timely one, but also a high regard and admiration for him. The subject of the address is "Some Street Railway Transportation Problems." The speaker needs no introduction to this club. He is one of its members, known personally or by reputation to all of us. I take pleasure in presenting to you Mr. Thomas Fitzgerald, General Manager of the Pittsburgh Railways Company.

"SOME STREET RAILWAY TRANSPORTATION PROBLEMS"

By Thos. Fitzgerald, General Manager of the Pittsburgh Railways Co.

Mr. President and fellow members of the Railway Club of Pittsburgh. I feel very much honored by your kind reception. It is an unusual one for a street railway man to receive, so that I am doubly grateful to you. I also appreciate the opportunity of putting before you some of the transportation problems that we are facing in Pittsburgh. I wanted to confine my discussion to Pittsburgh Railways problems, but it was indicated to me that I had best not restrict the discussion, but rather handle it on a broader basis, treating the problems that are general to the street railways throughout the country.

To my mind a necessary aim of a street railway is to make its facilities as useful to the communities it serves as possible. I would like you to keep this in mind all through this discussion, as it is an ideal towards which many street railway companies are working. I want also to leave it with you as the last thought in your minds when I have concluded.

There is no philanthropy about this idea of making the street railways more useful to the communities, because by increasing their usefulness they also increase their rewards. I believe that is the street railways could serve their communities in every way that it is desired of them, no questions would be asked as to the amount of money they make. Henry Ford has been making a useful product at a low rate of profit, being satisfied with a slight return on each unit sold. He has supplied the people with something that they much desire and no one seems to object to the size of the fortune he amasses.

The most important problem of a street railway is that of public relations. Its public relations are often made more difficult by the fact that it has not made itself as useful to the community as it might. This may come about either through lack of credit on the part of the street railway or through lack of cooperation between the street railway, the public and the municipalities served.

No public utility has so acute a problem in public relations as the street railway. The service as supplied by the gas, electric, water and telephone companies are more or less impersonal, while that of the street railway company is a matter of daily face to face contact. In this contact, because of the fact that there are many unwelcome rules which must be enforced and many privileges to which the public thinks they are entitled which cannot be granted and the further fact that some of our trainmen are not salesmen but are merely delivering transportation and collecting for it, makes that contact a source of irritation and annoyance. We are much dependent for favorable public opinion upon the attitude of our employes, as much so as upon the attitude of our officers.

I feel that there has been a change in the attitude of our men as they realized during the recent strike that public opinion was all-powerful, and from this realization they have come to the logical conclusion that they must sell their efforts and the company's efforts to the public if they are to achieve higher rewards in wages and better working conditions. The street railway is in frequent daily contact with its patrons and affects them not only in their home location and conditions, but also in their business arrangements. Affecting as it does the very life of the community, it is necessary that there should be close co-operation between the electric railways and the communities they serve, not only through the public itself, but through the official representatives thereof.

The co-operation is particularly desirable in view of the regulatory system which has grown up in this country which pertains to all forms of public service. The question of control and regulation by governmental authority is one of the principal features of public relations in Pennsylvania.

There are four different methods of regulation and control of public utilities which apply to street railway companies:

1. Regulation by a state commission as by the Public Service Commission in Pennsylvania.
2. Regulation by local authority as in Cleveland.
3. Operation or management by public authority as in Boston, where the Boston Electric Railway System is managed by State Trustees appointed by the Governor.
4. A combination of local and public service commission regulation as in the Pittsburgh Plan.

During the decade preceding the receivership of the Pittsburgh Railways Company and also during the receivership, the municipalities and the company were continually in the courts. It has been estimated that the legal expense of this lack of co-operation was more than half a million dollars during the 10-year period. Due to the lack of co-operation the Pittsburgh Railways Company had to expend so much of its time and energy in the courts that necessarily its efforts to render service were greatly hampered thereby. In some of these contentions the Public Service Commission favored the city, in others it decided in favor of the company. Throughout this period there was growing in Pittsburgh a desire for a voice in the control and regulation of the street railway lines. In recognition of this desire for home rule the contract between the City of Pittsburgh and twenty-eight adjacent municipalities and the Pittsburgh Railways Company which brought about the reorganization of the railways company also provided for the creation of the Traction Conference Board. This body of men, two of whom were appointed by the City of Pittsburgh, one by the outlying boroughs and the fourth by the Pittsburgh Railways Company, are vested with as great a power of regulation and control as is consistent with the Pennsylvania state law which retains for the Public Service Commission the control of fares and service. The Traction Conference Board is given supervision of the financial affairs of the company. The company is required to submit a budget for the coming year for the approval or disapproval of the Traction Conference Board. You will readily agree that if you give supervision and control of your financial transactions to this extent to a governmental body you have placed a very real power over your conduct in their hands. This Traction Conference Board has the right to inspect all books, maps, plans, reports and facilities of the company. In other words, it has full information available to it as to all the company's operations and transactions. The public in turn through the Traction Conference Board has this same access. It was our feeling that in any American community if you give the information to the public regarding your operations, and if you play a straight game, the community will treat you fairly. We have been operating under this agreement for twelve months and we are more than ever convinced that this is a sound proposition.

In Cleveland, which is probably the best example of home control of public utilities, they operate under a service-at-cost agreement. Control is vested in a Transit Committee of the City Council who are advised and function through a Transit Commissioner. They operate under what is known as a service-at-cost agreement. This has proven generally satisfactory in Cleveland, but with the recent passage of a new bus law, a conflict has been created between the control of street railways by the city council and the control of street railways by the Public Service Commission. Cleveland has also found it very difficult to finance extensions because of the limited return allowed on securities. An attempt has been made to avert this defect in the Pittsburgh Agreement, which permits the company to earn whatever may be necessary on new securities issued under approval of the Traction Conference Board. I might say parenthetically that the Pittsburgh Agreement is essentially a service-at-cost agreement, in that there is a proviso that provides for the reduction of fares in case there is a sufficient surplus created and an increase in fares in case of a deficit, both without protest of the interested parties, providing that the fare has been reduced from its present level.

One very interesting form of control is that of the management of the Boston Elevated by a Board of Trustees appointed by the Governor. The law which brought this into effect expires in 1928 and the question of its re-enactment is at present before the legislature.

Most people look upon the street railway business as a monopoly; that people are forced to ride with us and that we have no competition. As a matter of fact, we have very keen competition. Among the more important competitive forms of transportation are the private automobile, taxicabs, motorbusses, steam railroads, the telephone and Shank's mare or walking. This competition is very real, so much so that in some parts of the country there has been a considerable mileage of electric railway lines abandoned. First among these forms of competition are the private automobile and the motorbus. The effect of the private automobile is felt in every community, while that of the motorbus only in those which lack an adequate system of control of regulation.

The private automobile is not, however, an unmixed evil. It has made possible the betterment of the home life and has brought about the growth of the outlying communities which have in turn furnished a considerable amount of traffic to the electric railways. One automobile in a home cannot furnish all of the required transportation service. There is no doubt that in many sections of the country the competition of the private automobile has been very keen, especially so along the interurban lines where the construction of good roads has brought with it a large increase in the ownership of automobiles.

In some parts of the country the competition of unregulated motorbusses has been a very real menace to the transportation service of the community. Youngstown has recently enacted an ordinance which regulates the operation of jitneys within the city, the effect of which was to bring about a 10% increase in the revenues of the company.

Right here, I want to point out that the margin between financial success and failure in our business is very narrow. It is the last few fares which make for success or failure. In Philadelphia recently they increased their fare 20% and suffered a large reduction in traffic. A 10% reduction in traffic here would mean a receivership. The reduction in traffic in Philadelphia was brought about by the hostility of car riders to the increased fare. I might add that gradually, through a realization of the necessity and reasonableness of the increase on the part of the public, the Philadelphia Rapid Transit Company has regained some of this lost traffic. We are feeling keenly the competition of the private automobile here in Pittsburgh. This competition has made necessary the careful study and adjustment of our fare system and service to make them more attractive to prospective customers. Through the agency of the Traction Conference Board we have been able to make experiments not otherwise practicable, in service and fares, which have been in most instances productive of an increase in the usefulness of our facility as shown by increase in traffic. The point is, however, that unless the street railway conducts its business to the satisfaction of the public generally, that public can destroy the financial condition of the company by not riding.

I want to point out rather briefly some of the things that we have been trying, to make our property of greater use to the community. We have liberalized the transfer privileges, extended the fare limits in some instances, increased the service on certain routes, created a special form of Sunday transfer and more recently introduced the Sunday City Zone unlimited riding pass. We have the weekly pass in use in McKeesport and at Washington. We have put into effect a 5-cent zone fare on certain short lines in order to create short-haul traffic and to make our service of greater use to the communities we serve. All of these have been experiments. Most of them have proven successful. We could never have tried them, however, without the co-operation of the public given through the Traction Conference Board.

To me the most interesting of the experiments that have been made in the matter of fares have been those that take the form of a wholesale fare, that is the pass, which over definite lines and for definite periods of time may be used by anyone for as many rides as can be made. We feel that there is much that can be done in the study and readjustment of fares which will bring about a greater usefulness to the community and eventually a commensurate increase in reward to us. We have a facility that is idle or practically so, for twenty hours out of the twenty-four. During four hours of the day we handle the greater proportion of our business. For these four hours we must provide excess capacity and facilities equal to those required for maximum traffic during the other twenty hours. During the non-rush periods of the day we have half of our equipment in the barns and are hauling many empty seats. If it were possible to so adjust our fare system that we could sell these seats at 1-10c each during the off-peak hours we could increase the service rendered to the community and also increase our revenue. Our problem is to so manage our business that the public can use the excess supply of seats during the off-peak hours and outside the heavy traffic zones.

Naturally, the first idea that comes to you as a method of selling the empty seats is by instituting the zone fare system such as is in effect on the railroads; that is, where the price you pay is fixed in accordance with the distance you ride. This system is in extensive use abroad on street railways and is generally successful. The American fare system, however, has been built up on the basis of a flat fare, that is, one fare over a very large part of a given community. In many ways, this is desirable, as it extends the workingman's radius of travel and avoids the creation of a congested residential district adjacent to the industrial part of the community. Some years ago the zone fare system was tried here, but it had to be abondoned. In Canada a trial resulted in riots and destruction of property. The zone system has worked successfully in this country on interurban lines which are similar to railroads.

A few moments ago I mentioned that the weekly transferable pass is in use on the local lines in McKeesport and Washington. This is an attempt to give to the regular street railway customer an advantage in the purchase of rides. We have in use in the City of Pittsburgh a modified form of this ticket in the Sunday-only pass. Sunday differs from an ordinary weekday in that there is no rush hour and no compulsory riding and on Sunday, especially, the automobile is making large inroads in our business. The success that has attended the Sunday pass in increasing the use of our cars suggests that there are possibilities for the weekly pass in Pittsburgh.

The weekly pass is a form of ticket which ordinarily sells for 15 or 16 times the unit fare, which entitles the holder to ride as much as he desires within a fare zone or in some instances over a series of fare zones. This price is based on the assumption that the ordinary rider uses the cars twelve times a week, going to and from work. These twelve rides are taken during the rush hour and at a time when the cost of service is the highest to the company. In order to utilize the off-peak capacity the company in fixing the price for the pass charges for three or four more rides than the patron ordinarily takes, knowing that it is not possible for the holder to get more than one ride during the rush hour. The pass is transferable, the only limitation being that it is good for but one passenger at a time.

From the street railway point of view one decided advantage of the pass is that it is not physically possible to secure two rides during the peak hours. As the peak hours largely control the cost of supplying service, it is highly desirable that there be no necessity for increasing the service during this period at a lower rate of fare. Therefore, if it is to increase the economical usefulness of the street cars, the increase must come during the off-peak hours when there is capacity available. The weekly pass is really an approach to the zone fare system, because the rider can make more use of the cars and thereby reduce his unit cost per ride. We have been studying the possibilities of applying the weekly pass here. Many changes in fares have been made with a view to developing information on which an estimate of the proper price and the results of the use of passes may be based. These experiments are advisable and even necessary in order to prevent a serious impairment of the financial and physical condition of the street railway company and its property. A mistaken policy in this regard might retard progress toward greater usefulness for many years. Again, I repeat if it were not for the close co-operation between the railways management and the city, such a forward looking policy could not be considered.

The weekly pass is in use on fifty-five smaller companies in this country and England. The largest city that has used the weekly pass idea is Youngstown, O., where a 50% increase in the traffic and a 30% increase in revenue was produced, with only 4% or 5% increase in the car miles operated. The greatest increase in traffic was during the off-peak hours. During the experiment with the weekly pass it was found that the cash fares remained at practically the same level. Token fares dropped off some, but gradually recovered so as to bring about the increase in revenue noted above. The large use of the token and cash fare, in addition to the pass, is explained by the fact that a pass holder, feeling that he has his fare paid, desired to make use of the car lines after dinner, will take someone with him who will pay a cash or token fare. The so-called companion rides are in a measure responsible for the increase in revenue.

One of the very striking features of the weekly pass is its psychological effect. By the use of the pass the business contacts between patron and employe are reduced to one transaction per week. The holder of the pass merely exhibits it to the conductor, as he boards or leaves the car. It expedites the loading and unloading and seems to bring about a sense of ownership or possession that is most desirable upon the part of the public.

The pass is really an attempt to capitalize Henry Ford's idea of producing and selling a useful article at a low price.

I spoke a few moments ago of the contract which has been entered into with the City of Pittsburgh. In that agreement we have accepted a limitation of our earnings which have been fixed at 6 per cent on the valuation of the property as fixed by the Public Service Commission of Pennsylvania. No further money can go to security holders until fares have been reduced and a surplus created by economies in the management of the property. We are striving to furnish service as economically as possible and in essence we are operating under a service-at-cost agreement.

One of the economies which we have recntly put into effect is the operation of a number of light-traffic lines with one-man equipment. This makes possible an increase in service, and through more frequent service an increase in the usefulness of the facility which would not be possible with complete two-man car operation.

Another economy which is proposed is the operation of multiple unit trains on the Frankstown avenue line. A multiple unit train is one in which there are motors on all axles. The two-car train which we have used hitherto consists of a heavy motor car with heavy motors, which pulls a dead trailer, or trailer without motors. In a multiple unit train all cars are motor cars. Each unit can be operated separately, or a number of units can be put in a train and operated and controlled by one motorman. Under these conditions it is not necessary that there be large motors under the lead car. Consequently, there is an economy in power consumption. Furthermore, with motors under all cars, they start simultaneously, which eliminates the jerking which is so disagreeable in the dead trailers. Because they get under way more quickly, it is possible to operate them on time a greater proportion of the time. Again, multiple unit trains can be operated economically all day long with a consequent increase in service and with a comparatively small increase in the expense of operation. In the off-peak hours of the day twenty-four single cars, manned by forty-eight men, provide service on one of our lines. With seventeen trains, a 40 per cent increase in seating capacity would be provided, requiring an addition of only three men.

We are just starting on the rehabilitation of this property. Our agreement provides that the sum of $5,000,000 shall be put into the property for its rehabilitation. We really need much more. We have 270 miles of track that is from 25 to 28 years old. We need many more new cars. We have ordered 225 during the past year and are contemplating ordering more during the present year. We feel that the rehabilitation of this property is a vital necessity to Pittsburgh. We cannot rehabilitate the property and make it more useful to the community without the co-operation of the public. We are depending on the contract with the City of Pittsburgh, and the surrounding municipalities and we hope eventually to develop this property to such an extent that we will be giving Pittsburgh the efficient transportation which its unmatched resources justify. These activities, while purely local, are typical of the conditions which have to be met and answered by street railways everywhere. They are primarily dependent upon public relations and the success achieved is in proportion to the excellence of those relations.

Pittsburgh, with its strategic location, its vast natural resources, and its unexcelled opportunities for river transportation, when coupled with the extensive transportation service given the district by its six trunk lines, is in a dominating position in the United States. Pittsburgh undoubtedly will expand. It has every advantage that a city needs except that of adequate urban transportation facilities. The topography of the city makes difficult a satisfactory solution of the problem of urban transportation and its kindred problem, that of adequate housing. Given the quality of urban transportation justified by its resources and conditions, the housing will follow as a matter of course. Pittsburgh then will be able to spread out more generally over the district which now bears its name. The solution of Pittsburgh's transportation problems cannot be provided by street railways alone. Rapid transit must be a part of any solution. Rapid transit will come only through co-operation of the various interests in the city. Organizations such as yours can wield a powerful influence in bringing it about. Enduring progress is based on co-operation, which comes only as a result of confidence. Confidence can only be attained through understanding. I hope that this discussion before you tonight will give you a better understanding of street railway problems and induce you to give us your co-operation in helping to work for a bigger and better Pittsburgh.

PRESIDENT: Gentlemen, you have something to think about. Discussion is the best compliment that can be paid to any speaker, and I would ask you to be prompt and free in your discussion. And if you wish to know anything, now is your opportunity to question Mr. Fitzgerald.

MR. SAMUEL LYNN: I enjoyed very much the explanation of the Street Railway problem, as given by Mr. Fitzgerald. I promised earlier in the evening that I would not ask any questions, and I see Mr. Fitzgerald looking at me—he probably thinks that I did not tell the truth, but I will frankly admit, that after the interesting talk we had at a recent meeting. I was a little disappointed that Mr. Fitzgerald did not say anything about the loop problem. I believe there are a number of men here who would be pleased to have him tell us just what the benefits would be by the looping of the cars, provided he is at liberty to do so.

MR. FITZGERALD: I seem to have been laboring under a misapprehension. I understood that local street railway problems were more or less taboo. I am delighted, however, to have the opportunity of answering the question and will do my best to explain the situation.

The present congestion in the downtown triangle is responsible for much of the inadequate service of our lines. This condition also prevails on a great many other systems. We bring into and take out of the triangle district about 355,000 passengers a day, which is between 40 and 50% of the total traffic on the system. Delays of from 25 to 45 minutes are frequent in the operation of cars through the triangle solely because of the congestion. After about four years of study there has been developed a plan by which many of the cars are turned short of the most congested area. This, we believe, will eliminate much of the delay that is experienced at the present time and will greatly alleviate congestion under average conditions.

At the risk of boring you, I will try to describe the changes in routing which are proposed. The principal object is to improve the ability of lines reaching out from the downtown district to give dependable, regular service, as against the present undependable, irregular service. It is safe to say that if cars could be operated on their present schedules through the downtown district there would be little overcrowding and much better service. Regular service is impossible under present routing through congestion.

The idea back of the present plans is to withdraw the car lines as far as is necessary from the center of congestion to obviate irregular delays due to crossing and recrossing cars of other lines and lanes of other heavy vehicular traffic.

The loop used by the Fifth avenue lines is illustrative of the general principle. These cars at present operate down Fifth avenue to Sixth, then in Sixth to Liberty, crossing the eastbound traffic on Liberty—mixing up with the westbound traffic crossing all traffic in the Sixth street and Liberty avenue intersection north and southbound, and again crossing the heavy eastbound traffic at Fifth avenue and Liberty avenue. The cars of this loop are proposed to operate down Fifth avenue to Liberty, flowing with the eastbound traffic and not affected by the westbound traffic on Liberty avenue, to Sixth avenue, and out to Fifth avenue and their present route. The Forbes street cars, which now operate through the same congestion on Liberty from Sixth to Fifth avenue, are proposed to be withdrawn from contact with the Fifth avenue cars in the downtown district by proceeding in Forbes, continuing to Diamond to Grant street, to Fifth avenue, to Sixth avenue, to Forbes street, and out over their present route. This reroutes the Forbes street cars so that passengers not wishing to walk the distance from Grant street to Liberty avenue will have to transfer to other lines to be carried to points covered by present routes.

Other changes are the rerouting of the Second avenue lines from their present route over Third avenue, from Smithfield to Market, to Fourth avenue, and out Fourth, changing the route to Smithfield street from Third avenue to Fourth avenue.

This change will take all of these Second avenue cars out of the congestion on Third avenue, between Smithfield and Wood streets, and permit additional service in Third avenue, for the South Hills traffic, thereby relieving the loading congestion at that point.

Some of the lines from the South Hills now operating to Seventh avenue, or the Union Station will be routed over Third avenue, but transfers will be given for the completion of the ride.

The cars on the West End loop will not be changed.

On the North Side lines' loops no considerable changes are suggested. Several lines are rerouted over Penn instead of Liberty, a change of one very short block. One line is changed from the Seventh avenue-Grant-Liberty avenue loop to the Ninth-Penn-Seventh-Duquesne way loop, but transfer privilege is provided for a continuation of the ride.

To repeat, the plan withdraws some lines from the central traffic jam, thereby releasing them from the detention of that jam and allowing them to operate on a regular headway. In addition, the relief to other through routed lines will be considerable and the general traffic relief will be marked. The capacity of all lines, even with the present number of cars, will be greatly increased and with additional cars under order, a further increase in facilities and service can be afforded.

To give you some idea of the demoralizing effect of the downtown traffic congestion, I cite our recent experience over a period of five days preceding the public hearing before the Traction Conference Board. In those five days 90 cars per day were turned short of their destinations solely on account of downtown congestion. This means, as you know, thousands of passengers waiting for cars which should have served them being jammed into overcrowded cars which were able to reach them, and of other passengers being compelled to leave cars short of destination in order that delayed cars might be turned back to provide such service as could be rendered under such demoralized conditions. The effect is to keep the service in a state of almost continual demoralization from morning until night time, when vehicular traffic is reduced. It takes hours and the operation of many extra cars to re-establish regular operation after a general delay, due to such causes as congestion, fires, parades, etc. Delays from congestion are recurrent all through the day. Rarely during the day can the lines recover from one delay before another is encountered.

We believe that the proposed routing will so improve the regularity and capacity of the service that instead of 355,000 passengers coming into and going out of the downtown district, there will be more nearly 400,000 brought in and out to serve and be served by the business and commercial establishments therein. Generally, property values should improve under such a situation.

From the average car rider's viewpoint the case seems to be that at least 90% of the traffic of the railways is inconvenienced and delayed by the delays due to congestion, whereas a recent survey indicated that only 10% of the total railways traffic would be compelled to transfer or walk a short distance by the plan to reroute. To explain the 90% I ask your attention to the fact that a 30 or 40-minute delay on a line in the city affects service as far away as Charleroi, Washington, McKeesport, Trafford City, Emsworth, etc. It is impossible to keep enough men or cars in reserve to fill out the gaps in outbound routes delayed in evening peak congestion.

In this connection, 50% to 60% of the railways traffic is served entirely outside the downtown triangle, and is not affected by the destination of cars in the triangle. This majority of the traffic is seriously affected by demoralized service.

Suggestions have been made that all lines be operated from one outlying district to another through the downtown congested district. The answer to this is that general through routing is impossible on account of the fact that the streets of the district cannot accommodate the number of cars involved in such operations. Through routing cannot be made successful from an operating standpoint in our opinion, anywhere. And in Pittsburgh, with its narrow, irregular streets, it seems entirely impossible. The cost to the car rider would be tremendous, both in car fare and in impaired service. However, in order to secure the co-operation of the Pittsburgh Realty Board, who espoused this idea, we agreed to a limited trial of through routing four lines in return for their agreement that our rerouting plans should be given a trial. This trial of through routing will cost about $100,000 per annum, and will not be tried unless approved by the Traction Conference Board. This cost is due to the fact that it is impossible to balance service to traffic on both ends of a through line. One end of the line may require 10 cars an hour, whereas the other end would require only six. This might be the case at one time of the day. At another time the situation might be reversed. The result: both ends must be given the service required by the maximum demand on either end. Five extra all-day cars could easily cost $20,000 apiece per year. Motormen's and conductors' wages on one regular 18-hour car for one year are $8,803 per year. Other expenses will be nearly twice this amount.

PRESIDENT: I notice a gentleman here from Butler. Mr. Bailey, may we hear from you?

MR. F. G. BAILEY: I have enjoyed the talk very much, and being in the supply business, I can understand that their problems are very much more difficult in a city like this, where all the business comes in to one point.

PRESIDENT: There is another gentleman here from the Beaver Valley Railways Company. Have you anything to say, Mr. Smith?

MR. C. D. SMITH: Nothing on short looping, on account of the peculiarities of our "shoestring" system. But I can say that we have been carrying out the experiments on weekly passes to our satisfaction. Moreover, we have a 100% one-man car system and I know that Mr. Fitzgerald is absolutely right on the economies of one-man car operation. If it were not for the

100% one-man car operation in the Beaver Valley we would not have a street car system.

PRESIDENT: I see a man from the Harmony line, Mr. Altsman.

MR. W. H. ALTSMAN: I believe Mr. Fitzgerald is right about short looping the Pittsburgh Railways Company cars, as he just outlined their situation in the city this evening.

The Harmony and Short Line interurban cars are operated to the city limits by our own crews, then the cars are in charge of the Pittsburgh Railways Company, as they are operated over their tracks to the city terminal.

Our company has no relation whatever in the short looping problem.

PRESIDENT: Mr. Severn, you live on the South Side. Have you any kick coming?

MR. A. B. SEVERN: All I can say is that I believe in and would appreciate some of that short looping down Third avenue and I want to thank Mr. Fitzgerald for his efforts in our behalf. I fully realize what Third avenue traffic is, and I am just waiting for some of that short looping to hurry up and help us out.

PRESIDENT: I happen to know that there is a gentleman here from Coraopolis, a former railroad man who is now a banker. I suppose he does not ride on street cars now, but once in a while he may have to. Mr. Stark.

MR. F. H. STARK: I have been very much interested in the discussion. I am not in the employ of the Pittsburgh Railways Company, nor have I any direct interest in it, but I do think that something might be considered from the Allegheny county standpoint. When I come to Pittsburgh by automobile I meet a great deal of congestion and I wish the street cars were out of the way. Then, too, when I ride down to Coraopolis on the street cars I am just a little bit out of tune because I am paying three fares. However, in justice to the street car company, something might be said in regard to changed conditions. The street car has competition now that cannot be overcome and it should be considered from a business standpoint. I believe that anyone who is familiar with it knows that the street car company cannot afford to construct tunnels in Pittsburgh, and do it on their present earning capacity, and if we are going to have Pittsburgh take in all Allegheny county, Pittsburgh and the now outlying boroughs should bear a part of this burden. If the subways are constructed and financed by the city of Pittsburgh and the county of Allegheny and leased to the street railways on a reasonable basis, Allegheny county will enjoy the benefit by a rapid growth of our rural districts which will help to solve our housing question. I talked to a street car conductor one day and he enlightened me more than anyone else had ever done. I asked why the Pittsburgh Street Railway never built subways in Pittsburgh. He said: "Do you realize how many people are carried in Philadelphia and New York in a day, as compared with Pittsburgh?" I had no idea. When he told me the number they handled I could readily see that there is a difference.

I believe Pittsburgh will have to bear a share of this cost of tunneling and get street cars off the surface to make room for the automobiles, which are here to stay, and I believe that would, in a large measure, correct the trouble. This short looping is only a temporary expedient because the street cars and the automobiles will become more congested in the future, and it will have to come sooner or later. New York and other cities co-operate with the transportation companies, for it is a mutual proposition. Mr. Fitzgerald has not touched this phase of the subject. Its scope is large and involves a tremendous outlay to reconstruct the whole system. He has treated the subject as a whole in a masterly manner and our club is indebted to him for this, his valuable contribution.

MR. E. EMERY: Speaking of subways, I had a little chat with Mr. Phillips in regard to that very subject, and he could give us some very interesting information as to what it would mean to put subways in the downtown district.

PRESIDENT: Mr. Phillips, we would be very glad to hear from you.

MR. F. R. PHILLIPS: I hesitate to launch into a discussion of these matters, because the hour is getting late and I do not know when to sit down when I get started on the subject of subways, or, separate grade facilities, as they are sometimes called. In view of the fact that the report of a special engineer employed by the city of Pittsburgh is to be presented in the very near future, it would come with ill grace, on my part, if I should discuss the subject at this time. Insofar as the subject that has been presented by Mr. Fitzgerald is concerned, it has been so well presented that there is nothing I could add to it. With your permission, I will let it go at that.

PRESIDENT: That is a nice way out. I wonder if we could get Mr. Fitzgerald to give us the underlying difficulties which confront us in these different subway projects, their advantages and disadvantages, in a general way.

MR. FITZGERALD: I purposely sidestepped that just as Mr. Phillips did.

PRESIDENT: Is there any further discussion? We would like to hear from anyone who has anything to say. I see Prof. Endsley in the room. I wonder if he can tell us anything about the rapid transit situation in New York that would have a bearing on our problem.

PROF. L. E. ENDSLEY: I did not get in in time to hear the paper and I haven't anything to say on it. I could tell you how Bill Rodgers solved all these questions, and you might try it out. His plan was to have everybody going north and south move Mondays, Tuesdays and Wednesdays, and every one going east and west Thursdays, Fridays and Saturdays, and allow nobody to turn around.

But it is a big problem in Pittsburgh. I do not believe you will allow machines downtown some of these days. As I said, I did not hear all this talk. My train was late. If I had come on the street car I would have been here a little sooner. I enjoyed very much the last talk. That is the thing for Pittsburgh. We all want Pittsburgh to be a big city. Tell people about it. The sooner we get to talking about a big city the sooner we will get to be a big city. But most of the trouble around Pittsburgh, as it is everywhere else, is that everybody is afraid somebody will do something first. There is a little political ring here, as there is everywhere else. I was never in politics except one day I was on the election board. I thought my business there was to help people to vote, but I soon found out my mistake. I was there to keep the other fellow from voting. That was out in Indiana. I have never cashed the check I received for that day's work. I framed it and I have it yet

I enjoyed all I heard of the discussion. I am glad I am here and sorry I was late.

PRESIDENT: Mr. Wildin, have you anything to add?

MR. G. W. WILDIN: I am very much in the same fix as my good friend from Coraopolis, Mr. Stark. I have owned an automobile for about 14 years and tonight is the first time I ever had anyone suggest that I get rid of it and use street cars in order that their earnings may be augmented. I do not know that I can say very much which would be of enlightenment on the street car situation in Pittsburgh. I have listened with considerable interest and benefit to Mr. Fitzgerald's talk and have received more enlightenment therefrom than I ever had on the subject.

I do know that the street car service in Pittsburgh has been materially improved within the last three or four years. I have heard a great deal of kicking about the street car service in Pittsburgh. During my short life I have traveled a great deal in the various parts of this country, and would say the street car service in Pittsburgh has its good and bad phases, the same as you find everywhere. The general tendency is to kick, as that is the easiest thing to do and costs nothing. To kick and criticize is easy, but what is wanted by the street railway officials is constructive criticism and a little tolerance until they can get finally on their feet. I call to mind one street car line in Pittsburgh in which I consider the service very good, having used the same steadily for about four or five years, that is street car line No. 75. Further than that, I cannot say anything of additional interest except, possibly, to Mr. Fitzgerald, that it is a little easier to talk about the money he is going to get to complete his great work than to get it.

PRESIDENT: When you referred to the improvements, did you have in mind the operation or the foundation of some of the lines, like the Butler street line?

MR. WILDIN: I tried to forget some of the track and street conditions, as I know they cannot all be taken care of at once, but I will say that they certainly show their age, which Mr. Fitzgerald has given at about thirty years.

PRESIDENT: Mr. Fitzgerald might give us an idea of what it costs for foundation work. Take Carson street, Butler street, or Bellevue, for instance. Compare them today with what they were two years ago, and you will find a very great difference. Can you give us some idea of what you have been doing with the tracks?

MR. FITZGERALD: I would rather let that rest. There is much work yet to be done on the tracks. The receivers did a lot of splendid work. But we still have about 270 miles of track in paved streets that is from 20 to 28 years old. The receivers made a good start. They did their work in places where it would be seen by the largest number of people. They should have, for that is where track is used most and repairs needed most. We hope to be able to keep up the good work and improve on it, but so far we have not been able to do all we would like to do.

We are concentrating our best efforts on the improvement and increase of rolling stock. The low-floor car in use in Pittsburgh is to my mind the best transportation facility for street railways in the United States. We propose to secure as many more of these cars as we possibly can secure money to purchase. To finance the purchase of new equipment and facilities the utmost economy is necessary. Rerouting, to stimulate traffic and restore sound operations, is also necessary. When we get some of the big, heavy "battleship cars" off the street, which pound out the tracks faster than we can repair them, and can use the lighter, low-floor cars, then we will have a real basis for progress. Our tracks cost between $50,000 and $75,000 a mile to replace. It seems folly to spend this money before we can protect track by the use of lighter cars.

PRESIDENT: I thought Prof. Endsley was going to ask what had become of the double deck cars.

MR. FITZGERALD: The answer to the double-deck car is that you cannot get the people on and off in any reasonable time on a heavy-traffic line. They are wonderful from the standpoint of track capacity. You could transport from 50% to 75% more people on the same tracks under the same conditions if you could get the people on and off the cars. The difficulty of designing steps to the upper deck so as to expedite the loading and unloading of passengers has not as yet been solved. Until it is, the double deck car will not be widely used.

MR. LYNN: We have had a very interesting presentation of the problems of the Pittsburgh Railways Company. Mr. Fitzgerald has stated frankly the conditions under which they are now operating and what they are trying to do for the people of Pittsburgh in the way of improving their transportation system and in my opinion, this Club is indebted to Mr. Fitzgerald for the interesting manner in which he has presented their problems and I would, therefore, move that a rising vote of thanks be extended to him as an expression of our appreciation for his presentation of the subject.

PRESIDENT: Before putting that motion, I wish to make a personal statement to explain an absence which might be interpreted as inattention to the duties of office. Your president expects to be absent from the country for a few months. He plans to leave February 4th from Los Angeles, going west, and return by way of New York about the middle of May. If he sees anything he thinks would be of interest to the Railway Club of Pittsburgh he will duly report the same when he returns. The Railway Club is such a splendid organization and the details are in such good hands that there is no question that it will do its usual good work during the absence of its figurehead.

(Vote of thanks carried unanimously. Adjourned.)

J. D. CONWAY, Secretary.

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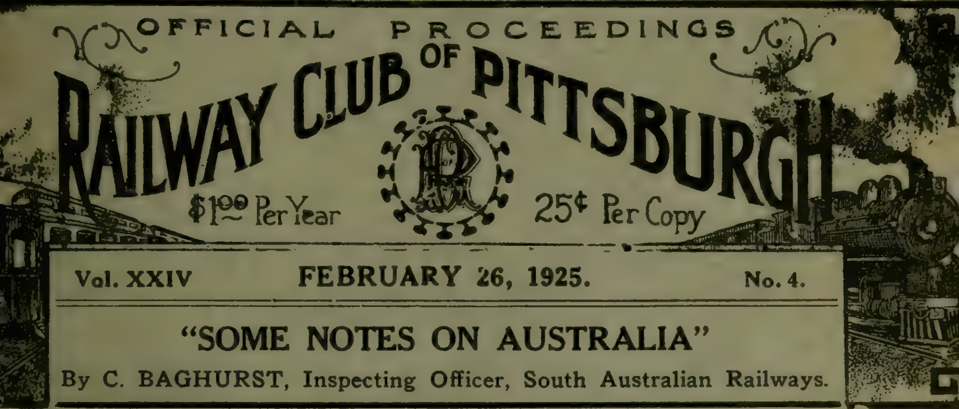

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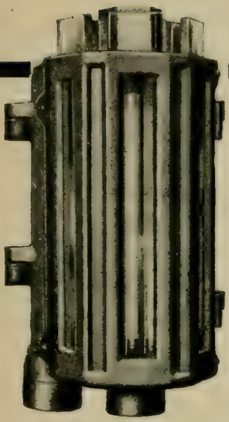

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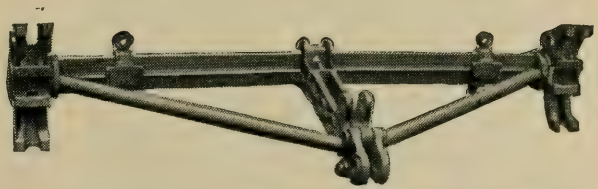

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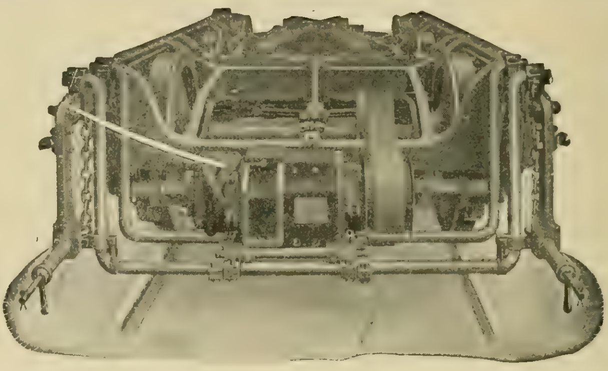

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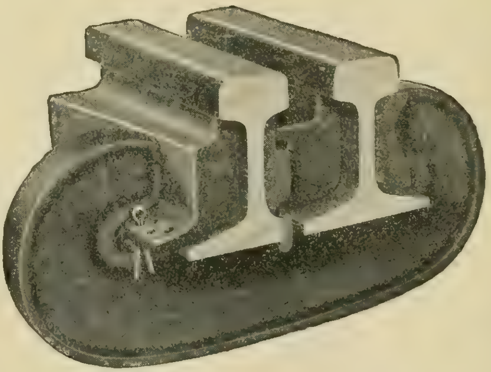

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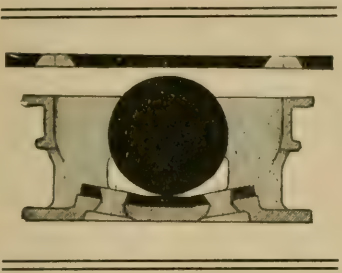

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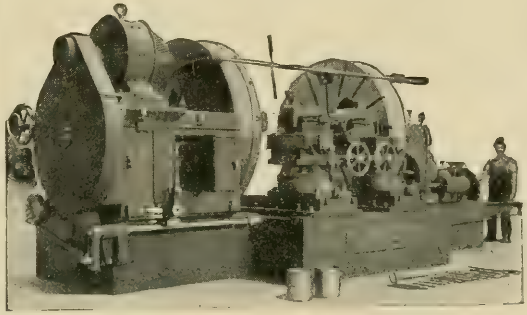

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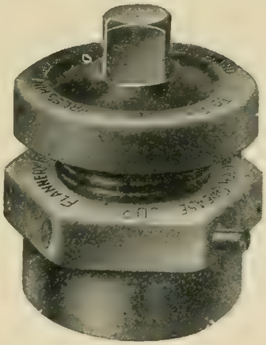

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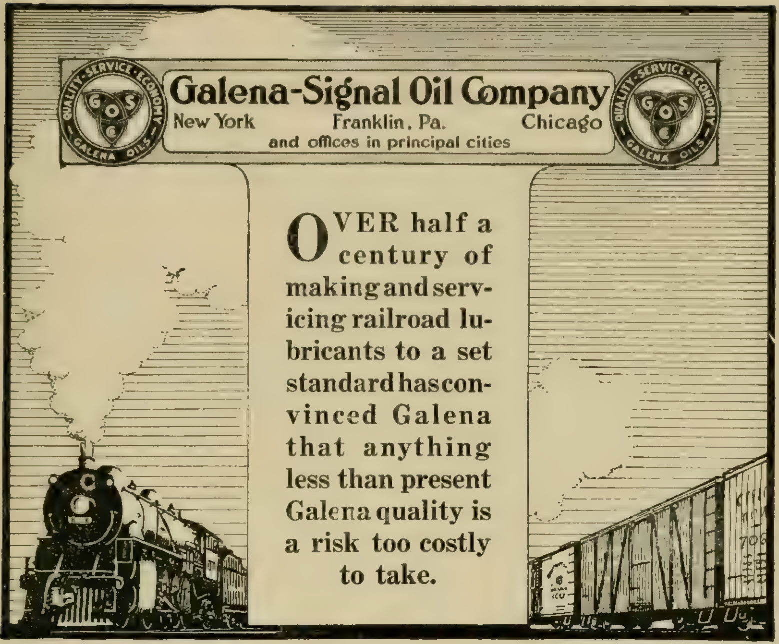

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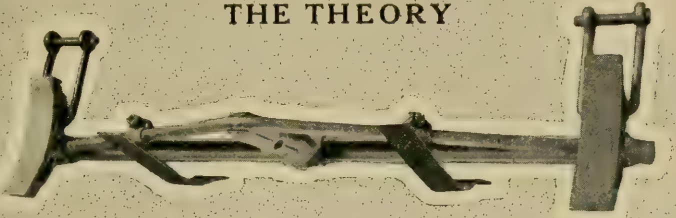
INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	viii
American Brake Shoe & Foundry Co.	iii
American Locomotive Co.	vi
American Steel Foundries	xvii
Baldwin Locomotive Works	viii
Ball Chemical Co.	v
The Bradford Corporation	ix
Brady Brass Co.	Front Cover
Chicago Railway Equip. Co.	xiii
Davis Brake Beam Co.	i
Dearborn Chemical Co.	iv
Flannery Bolt Co.	x
Fort Pitt Malleable Iron Co.	xi
Galena-Signal Oil Co.	xi
Gould Coupler Co.	ii
Graham Bolt & Nut Co.	Front Cover
Hagan, George J. Co.	Front Cover
Hunt-Spiller Mfg. Corporation	x
Johns-Manville, Inc.	xvi
Johnson Bronze Co.	i
Locomotive Stoker Co.	xv
McConway & Torley Co.	xv
National Malleable and Steel Castings Co.	iv
Niles-Bement-Pond Co.	vi
O'Brien, Martin J., Co., Incorporated	Front Cover
Paxton-Mitchell Co.	iv
Pgh. Testing Laboratory	Front Cover
Pressed Steel Car Co.	xix
The Q. & Co.	ii
Railway Equip't. and Publication Co.	iii
Railway Steel Spring Co.	xvi
Safety Car Heat. & Lighting Co.	xvi
Schaefer Equipment Co.	v
Sipe, James B., & Co.	iv
Southern Wheel Co.	iii
Standard Safety Nut Corp.	Front Cover
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	iii
The Superheater Co.	Front Cover
Suydam, M. B., Co.	Back Cover
The Symington Co.	v
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xviii
U. S. Metallic Packing Co.	xvi
Vapor Car Heating Co., Inc.	xviii
Westinghouse Air Brake Co.	vii
Westinghouse Elec. & Mfg. Co.	vii

THE THEORY



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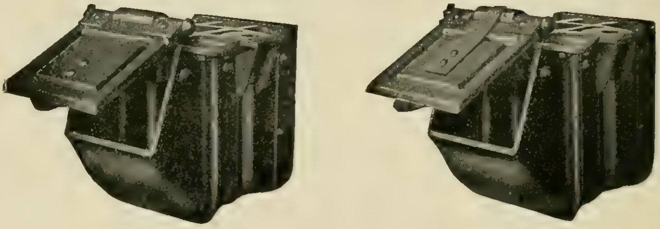

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OF
The Railway Club of Pittsburgh

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No. 4

Pittsburgh, Pa., February 26, 1925.

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Past Presidents

*J. H. McCONNELL	October, 1901, to October, 1903
L. H. TURNER	November, 1903, to October, 1905
F. H. STARK	November, 1905, to October, 1907
*H. W. WATTS	November, 1907, to April, 1908
D. J. REDDING	November, 1908, to October, 1910
F. R. McFEATTERS	November, 1910, to October, 1912
A. G. MITCHELL	November, 1912, to October, 1914
F. M. McNULTY	November, 1914, to October, 1916
J. G. CODE	November, 1916, to October, 1917
D. M. HOWE	November, 1917, to October, 1918
J. A. SPIELMANN	November, 1918, to October, 1919
H. H. MAXFIELD	November, 1919, to October, 1920
FRANK J. LANAHAN	November, 1920, to October, 1921
SAMUEL LYNN	November, 1921, to October, 1922
D. F. CRAWFORD	November, 1922, to October, 1923
GEORGE D. OGDEN	November, 1923, to October, 1924

*—Deceased.

Meetings held fourth Thursday of each month except June, July and August

PROCEEDINGS OF MEETING
FEBRUARY 26, 1925.

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., at 8 o'clock P. M,. Past President D. M. Howe in the chair.

The following gentlemen registered:

MEMBERS

Abel, A. W.
Adams, Frank T.
Adams, W. A.
Ainsworth, J. H.
Allen, Harvey
Altsman, W. H.
Anderson, A. E.
Ashton, William H.
Babcock, F. H.
Baer, Harry L.
Bage, R. E.
Bain, George F.
Balzer, C. E.
Bartholomew, W. S.
Beam, E. J.
Berg, Karl
Berghane, A. L.
Bingham, Geo. H. Sr.
Boiselle, R.
Brower, J. E.
Chalker, A. R.
Collins, William
Cox, William C.
Crawford, D. F.
Croke, Thomas F.
Cunningham, R. I.
Dambach, C. O.
Davis, C. E.
Davis, Charles I.
Dierker, R. H.
Dunbar, H. F.
Edwards, C. H.
Emery, E.
Farrington, Robert J.
Fowler, Jr., W. E.
Fritz, A. A.
Fults, J. H.
Gilg, Henry F.
Goda, P. H.
Greene, W. F.
Haas, J. W.
Hansen, William C.
Headington, R. V.
Herrold, A. E.
Holmes, E. H.
Hood, J. M.
Hoover, R. C.
Howe, D. M.
Hudson, W. L.
Hulick, E. G.
Husson, Jr., A. C.
Hyde, W. B.
Joyce, S. F.
Joyce, T. J.
Jungbluth, Adolph
Kearney, J. W.
Kelly, H. B.
Kelly, Leo J.
Kennelly, D. F.
Knapp, A. D.,
Knox, William J.
Lanahan, J. S.
Lawson, A. F.
Lawson, A. T.
Laurent, G. F.
Laughner, C. L.
Lehr, H. W.
Lewis, Herbert
Lohr, Allen W.
Long, R. M.
Lower, N. M.
Ludgate, B. A.
Lynde, L. E.
Lynn, Samuel
Maliphant, C. W.
Maloney, J. J.
Mann, N. T.
Miller, J.
Mitchell, F. K.
Mitchell, W. J.

Mitchell, W. S.
Moyer, Oscar G. A.
Muir, R. Y.
McGarrigle, J. J.
McGirk, John D.
McLaughlin, H. B.
McVicker, William
Nieman, H. L.
Norris, J. L.
Nutt, Col. H. C.
Obermeier, L. J.
O'Neill, Thomas J.
Orchard, Charles
O'Toole, J. L.
Parke, F. H.
Passmore, H. E.
Penn, William
Posteraro, S. F.
Prouty, E.
Purnell, C. S.
Rauschart, E. A.
Renshaw, W. B.
Roberts, S. S.
Robinson, R. L.
Rogers, Robert
Saltic, Thomas
Sattley, E. C.
Schrecongost, C. P.
Scott, J. C.
Seibert, W. L.
Sener, H. H.
Severn, A. B.
Shellenbarger, H. M.
Smith, John L.
Smith, R. W.
Spangler, C. P.
Stewart, L. S.
Strohmer, John L.
Sutherland, Lloyd
Thompson, L. D.
Timme, W. F.
Walker, J. W.
Walter W. A.
Walther, G. C.
Ward, John
Weiss, K. C.,
Weissert, G. F.
Wheatley, William
Wheaton, L. B.
Winslow, S. H.
Wright, John B.

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Angstadt, Edward
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Collins, G. C.
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Cotter, George L.
Davis, William B.
Egan, J. T.
Flower, E. S.
Flynn, E. E.
Gee, George H.
Jex, W. A.
Jones, D. S.
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Karns, C. A.
Kennedy, W. R.
Klinefelter, F. A.
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Neale, W. W.
Neil, C. O.
Payne, H. A.
Pirtle, C. L.
Ranson, W. L.
Rief, Joseph
Schmidt, A. C.
Schrontz, S. B.
Sefton, H. W.
Starr, A. D.
Whipple, A. L.

The call of the roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with, as they are to appear in printed form.

The Secretary read the following list of applications for membership:

Allen, Harvey, Service Engineer, Clark Car Company, 347 Columbia Avenue, West View, Pittsburgh, Pa. Recommended by H. E. Chilcoat.

Ball, Fred M., District Manager, Franklin Railway Supply Co., Inc., 1200 Cunard Building, Philadelphia, Pa. Recommended by J. A. Spielmann.

Bishop, H. G., Asst. Road Foreman of Engines, Penna. R. R. System, Markle Apartments, Monongahela, Pa. Recommended by William McCauley.

Car-Skaden, W., Manager, Argo Asbestos & Rubber Corporation, 611 West Diamond Street, N. S., Pittsburgh, Pa. Recommended by D. J. Redding.

Clark, L. A., District Manager, Wayne Tank & Pump Company, 443 Union Trust Building, Pittsburgh, Pa. Recommended by J. D. Conway.

Cordic, P. R., Terminal General Foreman, B. & O. R. R. Co., 4331 Second Avenue, Pittsburgh, Pa. Recommended by J. A. Spielmann.

Ecker, George Benjamin, Instructor Fuel Economy, B. & O. R. R. Co., 73 Hazelwood Avenue, Pittsburgh, Pa. Recommended by J. A. Spielmann.

Farlow, George B., Assistant Engineer, B. & O. R. R. Co. 401 B. & O. Station, Smithfield & Water Streets, Pittsburgh, Pa. Recommended by J. A. Spielmann.

Gochnour, J. P., Engineman, Pennsylvania Railroad System 103 South 22nd Street, Pittsburgh, Pa. Recommended b William McCauley.

Hill, James L., Asst. Road Foreman of Engines (Mon. Div.) Penna. Railroad System, P. O. Box 227, Youngwood, Pa. Recommended by Wm. McCauley.

Karns, C. A., Sales Department, Edgewater Steel Co., P. O. Box 249, Pittsburgh, Pa. Recommended by D. W. McGeorge.

Kennedy, W. R., Sales Engineer, Clark Car Company, 1619

Oliver Building, Pittsburgh, Pa. Recommended by H. E. Chilcoat.

Lesher, B. F., Special Inspector, General Manager's Office, B. & O. R. R. Co., 2133 East North Avenue, Baltimore, Md. Recommended by C. H. Durant.

Long, J. Frank, Gang Foreman, Pennsylvania Railroad System, 912 Howard Street, Monongahela City, Pa. Recommended by C. G. Skuce.

McGeachie, Andrew B., Asst. Road Foreman of Engines, B. & O. R. R. Co., 512 Grant Avenue, Millvale, Pa. Recommended by J. A. Spielmann.

Pastre, Harry A., Supervisor District Offices, Elliot Company, 718 Frick Building, Pittsburgh, Pa. Recommended by D. J. Redding.

Paul, Lesley C., Manager Railway Publicity & Advertising, Westinghouse Elec. & Mfg. Co., 6925 McPherson Street, Pittsburgh, Pa. Recommended by L. E. Lynde.

Ranson, William L., Special Sales Representative, Graham-White Sander Corporation, 1525 Twenty-ninth Street, N. W., Washington, D. C. Recommended by A. E. Herrold.

Walther, Charles W., Foreman Car Repairs, Pennsylvania Railroad System, P. O. Box 769, California, Pa. Recommended by Charles E. Boyer.

Weiler, Paul, District Manager, Franklin Railway Supply Company, Inc., 8 Taft Place, Dunkirk, N. Y. Recommended by M. A. Smith.

Woernley, Theodore R., Clark Car Company, 1328 Wood Street, Wilkinsburg, Pa. Recommended by H. E. Chilcoat.

PRESIDENT HOWE: These applications will be referred to the Executive Committee in due course, and upon approval by them, the gentlemen will become members without further action than the payment of one year's dues.

If there is no further business, it will be my pleasure to introduce to you Mr. C. Baghurst, Inspecting Officer for the South Australian Railways, who will address the club upon the subject, "Some Notes on Australia."

"SOME NOTES ON AUSTRALIA"

By C. Baghurst, Inspecting Officer, South Australian Railways.

Mr. Chairman and friends: A few weeks ago your president, Mr. A. Stucki, asked me to give you a talk upon Australia and, in a weak moment I consented, little thinking what I was taking on. Railroad men here will, I know, understand what an ordeal it is to get on one's feet to speak. We usually leave it to the supply men and, believe me they can fill the bill well.

However, as I consented, I intend to carry on so, if there is any blame to be attached to anyone for the infliction of this talk upon you, hang it on your president. Evidently, he believes discretion the better part of valor and has taken a trip abroad and it will all be blown over by when he returns.

In the first place I was at a loss to know just how to attack the subject. Naturally you want to look at Australia through the eyes of a railway man but, to treat solely from that standpoint would perhaps be a little dry and, as it is not my intention to administer a sleeping draught, I propose to tell you a few of the interesting features regarding Australia apart from the railroads. For those of you, however, who are gluttons for railroad statistics I will endeavor to give you too, a square meal and not send you empty away.

Australia has been more in evidence with you of recent years because the various railway departments have sent several of their officers to America to study your methods of railroading and here I desire to place on record my appreciation of the many courtesies received at the hands of the different railroad officials and supply people I have met since being in America. So far, I have not been refused any assistance that it has been in your power to render. On the other hand, it has been impossible for me to accept the many invitations extended me from time to time to visit railroad shops and manufacturer's plants and, if I have failed to accept any particular invitation I want to assure you that it is only lack of time that has prevented me from so doing.

Little more than 100 years ago the Union Jack was hoisted at Port Jackson, New South Wales and Australia was proclaimed a British Colony, and at that time the white population numbered only 1024. Here we have a picture of an island continent with an area exceeding that of the United States with but a mere handful of people populating it. I may mention here that the one thing that has impressed me most during my stay in America is the few Americans who really grasp the significance of Australia's size. The only reason I can assign for it is the fact that one is apt to judge the size of a country by its population and, as Australia has a population of under 6,000,000, I think many are to be excused for underestimating its area. Needless to state I have done my best to correct this false impression.

There are one or two amusing incidents which I think will be of interest in this connection.

When dining with some railroad men at Atlantic City recently a discussion arose as to the size of Australia and they finally conceded it to be twice the size of Texas.

At St. Louis, a railroad man wondered how he would get on with me, as he was in doubt regarding what language I spoke, coming here from Australia.

One lady expressed, when told that Australia was an island, that she would hate living on an island.

Well, this island that the American would hate to live on is approximately 2,400 miles east to west and nearly 2,000 miles north to south, with an area twenty-five times that of the United Kingdom. Its northern extremity lies within 10 degrees south of the equator, while its southern extreme lies on the 39 degree line so that about one-third of its area lies within the tropics. This remaining two-thirds which lies in the temperate zone is the more thickly populated and for the most part of the year enjoys a salubrious climate. With the exception of isolated districts snow is very rarely seen and frosts occur very occasionally in mid-winter. The majority of Australians have never seen snow.

With the exception of the tropical zone the rainfall is extremely light in the summer months, three month rainless periods being the rule rather than the exception. On the other hand large volumes of water fall in very short periods and it may be interesting to recall that on April 2nd, 1911, 28.8 inches of rain fell in 24 hours at Kuranda, Q., and on April 3rd, 1898, 29.41 inches fell in 24 hours at Whim Creek, W. A. Thus a dry creek is transformed to a raging torrent in a very short space of time. These phenomenal rainfalls are caused by windstorms known as "Southerly Busters," which sometimes attain velocities of 80 miles an hour, evidently caused by intense heat action in the interior.

Naturally, the climate effects the character and habits of the people and we therefore find that they live an outdoor life and are very fond of outdoor sport, especially horse racing. On the day of the Melbourne, Cup, the race course will be thronged with 90 to 100 thousand spectators. It is said also that the Australian is a born gambler and there is an interesting tale about the minister and his vestrymen.

The minister announced that on the following Sunday he would preach upon the evils of gambling and, on arrival at the church he found his vestrymen having a little gamble amongst themselves as to whether he would take a verse from the old or new Testament for his text. In order to get the better of them he took for his text a verse out of the prayer-book.

The normal conditions in Australia are blue skies and sunny days of genial warmth, where golf, tennis and such like outdoor games are played practically the whole year round.

TRANSPORTATION

Australia has only one large river system and this is only navigable for a portion of the year. A scheme of locking, however, is now in progress and when complete will render this system navigable for 3,000 miles the whole year round. It will be readily seen, therefore, that the railroads have had to play a very important role in the development of the interior of Australia and will continue to be a very vital feature in the life and future development of Australia.

Practically the whole of the Australian Railways are State owned and operated. We have seen that with a dearth of waterways to the interior, it was essential to open up that interior by means of railways before an immigration policy of any magnitude could be launched. Private enterprise was not prepared to take the risks involved in railway construction with no prospect of a profitable return. The State therefore, was at the outset compelled to finance the construction. Even so, railway construction proceeded at a very slow rate due partly to the difficulty of borrowing money at reasonable rates of interest due to the depreciation of Australian securities in London, and partly due to the sparseness of population which it was feared would not justify the necessary expenditure.

Subsequently, as population increased and trade expanded it was considered desirable that the State should control all public utilities and enterprises which tended to become monopolies. The theory of State ownership is that a more efficient service is possible for the following reasons:

1. The State organization and resources are stronger than any combination of individuals and should lead to cheapening the cost of operations.
2. The State not looking for profit, the items which private enterprise charge against risk or failure, (and for which it is paid, even though no loss is incurred) need not be considered.
3. Such profits as results to the State should be applied in reducing the charges of transportation to the public and traders alike rather than payment of increasing dividends.
4. State enterprise excludes the middleman, who is often a cause of increased cost to the consumer.
5. State ownership eliminates wasteful competition.

On the other hand, political influence may cripple a wise administration of railways and this feature has undoubtedly been more or less a stumbling block in the past. The tendency today is to remove this political interference and, in this connection, many of you will have read the report of the special commission of experts who recently inquired into the railway system of N. S. W. In the commission's own words, "The railway system of N. S. W. is a great and valuable asset whether measured as a revenue producing machine or as a principal agency in the rapid development of the country. Despite certain deficiencies to which we call attention, it reflects credit upon those who have been responsible for its management. It is capable under good administration, of large net revenues and of providing cheap, speedy and adequate transport throughout the State."

We have heard quite a lot of criticism from time to time regarding the failure of the Australian Railways. Upon examination, however, it will be evident that the criticisms are one sided. In a fair criticism we must allow for development in so sparsely a populated country and here it is impossible to figure in dollars the benefit to commerce generally derived from reasonable transportation. It is better for the State to lose a little on its railways than the country should lose by not being able to compete in the world's markets on account of exorbitant transportation charges in order to make the railways pay a profit. Again one must consider the population of a country and here the figures prove that when the population is considered in relation to miles of railways and compared with other countries, the Australian Railways show distinctly favorable. Where a country has to be first opened up by means of railways it is reasonable to assume that the railways cannot be expected to earn a profit until the ratio of miles of line to the population of the country traversed is properly balanced. In this connection it will be well to observe here that America with a population of 105,000,000 has 270,000 miles of railways or 400 persons per mile of railway whereas Australia has a population under 6,000,000 with 27,000 miles of railways or only 230 persons per mile of railway, approximately twice the mileage of America when based upon population. As a matter of fact, Australia has more mileage of railways per 1,000 population than any country in the world and the following figures are illuminating on this point:

Country	Mileage per 1,000 Population
Australia	4.8
Canada	4.34
Argentina	2.6
New Zealand	2.41
United States	2.39
S. Africa	1.45
Great Britain	.50
India	.12

The curve showing the growth of Australia's railways compared with its growth of population is also very interesting. With the commencement of railways the population curve steepens and later the railway growth curve becomes steeper than the population curve indicating that the growth of railways was not warranted by the growth in population but for purposes of development of unpopulated areas. The building of the East-West Trans. Australian Railway, 1051 miles through undeveloped country for the purposes of connecting east to west, helped to make the curve steeper, but it will be many years before there will be a material increase in population of the territory traversed on account of unsuitability of land. The condition of the territory traversed by this line is portrayed in the fact that for the whole distance of 1051 miles not a single permanent stream is crossed and for one stretch of 300 miles across the Nullabor plains there is not a single curve in the track, believed to be the longest straight track in the world.

Another aspect not usually noticed by those who criticise

Australia is the fact that of its public debt no less than 60 per cent is accounted for by its Railways and Tramways, works directly yielding revenue, a very sound position you will agree.

The railways are financed out of loan money by the governments and interest charged at the average rate, which in the year 1922 was 4.65 per cent and the net earnings of the different State railways were:

State	Net Earnings 1921-2 %	Net Earnings 1922-3 %	Net Earnings 1923-4 %	Mileage per 1,000 pop.
N. S. Wales 4′-8½″	4.89	5.21	5.12	2.57
Victoria 5′-3″	4.39	4.9	4.92	2.82
S. Australia 5′-3″	3.55	4.59	4.8	4.69
W. Australia 3′-6″	2.72	3.80	4.9	10.62
Queensland 3′-6″	.81	1.57	1.53	9.12
Federal 4′-8½″	1.23	1.09	1.06	50.00

It will be seen that the different systems have been steadily improving and the year 1924 saw four out of the five systems on the mainland with a surplus after paying the interest on the capital outlay. The Federal Government line, being more a development line does not pay.

Further it will be noticed that in those states where the ratio of mileage to population is more nearly comparable with that of the United States, the railways make a profit after paying the interest on capital outlay. When the whole facts are laid bare and an unbiased view taken I maintain that the Australian Railways present a very good record.

A satisfactory railway is one that adequately provides for the business needs of the whole and does not hamper trade by high transportation charges.

The total mileage of Australian Government Railways in 1924 was 24,448 made up as under:

Q.	6037.93
N. S. W.	5562.47
Vic.	4391.20
S. A.	2451.63
W. A.	3608.36
Fed.	1733.02
Tas.	633.10
	24447.71

Private lines of 2830 miles make a total of 27277.71.

Whilst on the question of gauges it will, perhaps, be of interest to recall just how an odd gauge of 4′ -8½″ came to be adopted as a standard.

There have been several theories put forward, some very fantastic, having relation to the gauge of the chariots used in Pharaoh's days. As a matter of fact, this, like many other things, has been the natural outcome of a process of evolution by the elimination of undesirable features, or, put in railroading terms—"Working the bugs out."

Of course I'm not imparting any news to you when I say that railways preceded the locomotive, so that locomotive engineers had nothing to do with the gauge.

Railways, as far as can be ascertained, originated at the collieries in the north of England in the sixteenth century. (Newcastle to Tyne for shipping.) In the early days of mining a four-wheel, horse-drawn vehicle, known as a tram, was used to convey the coal from the pit head to adjoining works. It was found that the wheels readily cut into the soft earth, wearing ruts and rendering the hauling very difficult. It occurred to some one to drop some timber rails, similar to those used for fencing, into the ruts so worn, and thereby make the hauling easier. These primitive tracks became known as rail-ways or tram-ways. Later the hyphenated words were incorporated in two complete words—"Railways," referring more generally to long distances and heavy equipment, and "Tramways," to shorter distances and lighter equipment, sometimes also referred to as "Light Railways."

It was found that these timber rails wore out in a comparatively short time, and the replacement was an expensive item, so it was resolved to lengthen the life of these rails by securing iron plates to the upper surfaces. The men whose work it was to affix these plates, became known as "Platelayers," and to this day the men who lay the tracks are known in England as "Platelayers," not "Tracklayers" as in America.

With the advent of the plated rails, it was found that heavier loads could be hauled with a single horse (Tonnage was to the fore in those days, as now), and consequently the loads were increased. As happens today, increased loads brought with them their own peculiar problems. Under the increased loads, the plates buckled and it was impossible to maintain them secured to the timber rails.

Further, the trams would more readily get off the track (derail) into the sott earth. To meet these problems, cast angle iron plates were substituted with one flange turned upwards and on the outside to serve the dual purpose of keeping the trams on the tracks and prevent buckling of the plates.

The next step was the introduction of a "T" section plate set on its back and secured to the timber rails, and it was considered that a flange on the outer edges of the wheel treads would enable them to run on the vertical flange of the "T" section rail, giving the rail a long lift and at the same time keep the trams on the track. These "T" section tracks were laid to a 5′-0″ width over the outsides of the vertical flanges. Subsequent improvement led to the flanges being changed to the insides of the wheel treads instead of the outside. By this time considerable track had been laid, and a change in track gauge was out of the question, on account of expense, so that the gauge ultimately became the inside dimensions of the track and is what we now know as the "Standard" or 4′-8½″ gauge.

The first steam rail locomotive built, was for hauling coal from the collieries and naturally was made to suit the tracks as then existed. (Constructed in 1804 by R. Trevithick.)

The G. W. Railway of England was the one line to lay out a definite gauge which was 7′-0″, and ran for a number of years until the "Battle of the Gauges" in England compelled them to change to 4′-8½″. The change being completed about the year 1890.

Further, W. A. were prepared ot convert their track from Kalgoorlie to Perth to the 4′-8½″ gauge to complete the chain, and thus make possible a uniform gauge from coast to coast.

The situation at the moment is that a passenger, journeying from Perth to Brisbane, has to change trains no less than five times on account of breaks of gauge.

Unification is constantly in mind, and is undoubtedly Australia's most urgent need at the present time, but the cost of conversion is the stumbling block. A royal commission, consisting of three (one Englishman, one American, and one Australian) have recently reported that the 4′-8½″ gauge should be adopted, but that to convert all existing lines in the Commonwealth would involve an expenditure of 280,000,000 dollars. It is practically certain, however, that the 4′-8½″, or standard gauge will be finally adopted.

At the present time, South Australia and Victoria are building their new equipment with a view to conversion from 5′-3″ to 4′-8½″ with the minimum expense.

A scheme to build a 4′-8½″ line from Port Agusta to the present 5′-3″ rail head in S. A., and a third rail from the latter point on to Adelaide, is now proposed and likely to be carried into effect. This will shorten the distance between Perth and Adelaide by some sixty-eight miles, and effect a saving of time by no less than five hours.

Another scheme now agreed to, is the building of a 4′-8½″ line from Kyogle in N. S. W. to Grafton in Queensland, and the conversion of the present line from Grafton to Brisbane to 4′-8½″ gauge. This will shorten the distance between Sydney and Brisbane by one hundred miles, and a saving of six or seven hours in the time effected.

With these two separate schemes completed, and the conversion of the 3′-6″ gauge line from Kalgoorlie to Perth, the journey from Perth to Brisbane, a distance of about 3,320 miles, will be possible with only two changes.

In addition to the schemes mentioned, a further proposal now under consideration is to connect Hay in N. S. W. with the Adelaide-Port Agusta line, and so make it possible to journey from coast to coast without touching either Adelaide or Melbourne; and on one gauge. This scheme will reduce the distance East to West by some two or three hundred miles. This proposed line would follow the river Murray for some distance, and this would open up additional valuable territory.

THE GAUGE QUESTION

You are, of course, all familiar with the fact that we, in Australia, have a variety of gauges in our Railway System, viz: The States of Victoria and South Australia having a 5′-3″ gauge; New South Wales and the Commonwealth 4′-8½″; while Queensland and Western Australia have a gauge of 3′-6″.

It is difficult to explain the existence of these varying gauges excepting to state that early on in the history of Australia, the States of N. S. Wales and Victoria were the first States to consider railway construction. The Colonial office in London recommended a gauge of 4′-8½″, but the engineer in Sydney wanted a 5′-3″ gauge, and advised both Victoria and South Australia that the 5′-3″ gauge would be adopted. A subsequent change of engineers in N. S. W. reversed this decision, but meanwhile Victoria had ordered rolling stock and a line was in course of construction, the outcome being that the year 1854 saw Victoria with a railway of 5′-3″ gauge, while the following year the Sydney Paramatta 4′-8½″ gauge line in N. S. W. was opened for traffic. The first Australian railway was commenced, however, at Sydney in 1850.

South Australia being a neighboring State of Victoria, followed the lead of Victoria and commenced building a line of 5′-3″ gauges from Adelaide, and finally connnected up with the Victorian system at Serviceton, but in addition, built what was termed feeder lines of 3′-6″ gauge track. It was claimed that by this method, more territory could be opened up for the same capital outlay. This latter idea was responsible for the States of Queensland and Western Australia building their railways to a 3′-6″ gauge.

If you will study the map of Australia, you will realize that the prevalence of varying gauges did not present any great problems until recent years. You will also notice that each State has its own ports, with its own system of railways running therefrom to the interior in each instance. As the bulk of the trade was to and from the various ports, it mattered very little that the railway gauges varied in the several States. Further, the development of each State has been from the coast inwards, and interstate trade was well catered for by a frequent service of boats calling at the various ports. Queensland built no less than four separate railway systems, each commencing at a port, and the equipment was dispatched from their shops at Ipswich (near Brisbane) by boat to the various points, and it is only lately that these several systems have been connected.

The foregoing features, I think, explain why the guage question did not earlier receive the prominence and consideration it merited.

The difficulty arose when the several States wished to connect up and build up an interstate traffic, and of course, trade being on the increase year by year, the problems are intensified.

In the year 1901 a Federal Parliament was formed to take over all questions relating to the Commonwealth of Australia, and naturally the question of defense was early on the program with a more rapid method of transportation across the continent. The Commonwealth Government, therefore, laid plans for the building of two Trans-Australian Railways; one East to West and another North to South. As the lower half of the continent lies in the temperate zone and was more populated, the line East to West was pushed on with and a 4′-8½″ gauge line agreed to, to connect Port Agusta in South Australia with Kalgoorlie in Western Australia. The concensus of opinion at that time favored the adoption of a 4′-8½″ standard guage throughout Australia, but no agreement was come to by the various States to adopt a uniform gauge on account of cost. This line was commenced in 1912 and opened for traffic in 1917. The idea behind the decision to build this line of 4′-8½″ gauge, was, that with a new line across South Australian territory, it would be possible to connect up with the railway system of N. S. Wales, which was fast pushing westward.

PRESIDENT HOWE: We have been very much interested in the speaker's address. The subject is now before you for general discussion. If any one has a question to ask the speaker I know he will be very glad to answer same. I have been informed that Colonel Nutt is here this evening, and we would be pleased to hear from him.

COL. H. C. NUTT: I am sure I voice the sentiment of every member of the Railway Club here this evening when I present to the speaker our sincere thanks and appreciation for his most interesting and informing talk about the railroads of Australia. He asked to have one subject discussed a little further, the difference in weight per passenger between Australian passenger coaches and American passenger coaches, and I must confess that I am at a loss to explain it. Australia is not alone in having passenger coaches 70′ long and seating as many passengers as the American coach, but weighing only about two-thirds as much. We have increased very substantially the weight of our passenger equipment in the last fifteen years, going from all wood, through steel underframe and wood sheathing, to all steel equipment. But, in my experience in Europe during the war, I found their cars were all steel, the new ones, the same as ours. I would like to ask whether the Australian equipment is all steel or steel underframe and wooden sheathing?

MR. BAGHURST: We have no steel cars in Australia with the exception of some steel suburban cars recently built by the Leeds Forge Company in England. I was engaged in the car business in England and built quite a number of steel cars there, but we got the weight of our steel cars down to within a ton of the weight of the wooden cars.

COLONEL NUTT: The older cars in England are not what you call center aisle cars, they are cars with side entrances and there is less waste space in that type. A large percentage of floor space is taken up with seats. I have wondered whether the reason is not that our locomotives are a good deal more powerful and the extra weight in our passenger equipment is in the part from the floor of the car to the rail. I imagine a good deal of the extra weight is due to the fact that our locomotives are a good deal more powerful than are yours or the continental railroads. That, of itself, would necessitate a very much heavier underframe, and that, in turn, a heavier truck. A good many of the European cars do not have trucks, they have simply two pairs and sometimes three pairs of wheels supporting a car 60′ long where we have six pairs of wheels supporting a car 70′ long. Whether it is wise or not, the fact that our equipment has been developed along these lines is responsible for the weight. There is no question of the waste it leads to. But from my experience and observation, I think the fact that we have been putting more elaborate running gear under our cars, and the fact that our track is not as good as the European track, and then the fact that we have these very much heavier locomotives, necessitating the heavier draft gear and sills is the principal reason why our cars weigh so much more per passenger than the cars you use in Australia or those in use on continental or English roads.

I want to say just a little about the resemblances and differences that have occurred in the development of the railroad system in Australia as compared with railroad systems in the United States. The two are very much alike in some respects and differ very materially in others. The nature of the two countries is such that the development of the interior had to be preceded by the construction of the railroads. Our situation was a little better than that of Australia in that we had a number of navigable streams, and also in the fact that this country began to develop about fifty years before Australia did and about fifty years before the railroads were devised. One result of that was that in this country we began to build canals and built a great many of them. They were useful for a time and expedited the development of the interior of the country, but as soon as the railroads began to be practicable the canal development ceased and after the railroads had been in operation 25 or 30 years the canals became obsolete. The railroad was cheaper to build in the first place and after it was built if it had any considerable amount of traffic it could handle the freight and passengers more expeditiously and cheaply than the canals could. Of course Australia was spared that wasteful investment.

We both went through the same wasteful experience of building railroads of two or three or four different gauges. In this country the Erie Railroad was built 6′ gauge; those that started from the seaboard, except the Erie were built 4′-8½″; practically all the railroads southeast were built 5′ gauge; and a great many of the railroads in the territory between the Mississippi and the Rocky Mountains were built 3′ gauge. Only a few years ago we were in just about the condition Australia is today. But the change in gauge was brought about gradually in this country and I assume from what Mr. Baghurst says it is about the same in Australia. And there was no serious economic loss in this country in making the changes for the reason that most of the mileage that had to be changed was of a wider gauge than 4′-8½″. There were but a few thousand miles that had to be changed from the 3′ gauge to the wider gauge, and those that were wider than 4′-8½″ could be reduced to standard gauge without much expense. And that is true in Australia, about 60% of their mileage is over 4′-8½″ and could be reduced without much expense. So I can imagine that in 20 or 25 years the principal lines in Australia will be of standard gauge.

Whether conditions there would justify the enormous expenditures, we have made in building very heavy locomotives and cars I do not know. That has been the best development in connection with the American railroads there was. When I started in railroading, the heaviest locomotives we had were locomotives that today we would hardly use on branch lines. That meant a tremendous scrapping of equipment because we could haul so much cheaper in big trains with heavy locomotives, the small locomotives and cars had to be scrapped by the thousand. Whether conditions in Australia will develop sufficiently dense traffic to justify that I do not know. But in the various stages of development in Australia it seems to me that is one leaf out of our book of experience they might profitably study in Australia.

I want, again, to express to Mr. Baghurst my appreciation of his most interesting and instructive talk on the railroads of Australia.

PRESIDENT HOWE: I will call upon Mr. J. L. O'Toole, Superintendent of Freight Transportation, P. & L. E. R. R., for a few words.

MR. J. L. O'TOOLE: When Mr. Baghurst referred to the ludicrous ideas entertained by some Americans regarding Australia, as for example, its size and the language spoken by the people of that country, I was reminded of the Irishman whose idea of the inhabitants of Australia was even more ludicrous.

As the story goes, this Irishman and his sister emigrated from Ireland, the sister going to Australia, while the brother came over here and settled in New York. As was praiseworthy they kept in touch with each other through correspondence. After about ten years a letter reached the brother in which the sister announced her marriage to a native of Australia, leaving him to wonder about the kind of man he had for a brother-in-law. One day while visit-ing the Zoo in Central Park, he was found standing spellbound before a cage containing a Kangaroo. Right then and there he lost pride in his sister's choice of a husband for the reason that the card attached to the cage described the beast as "native of Australia."

In the course of his remarks, Mr. Baghurst properly made the point that in any comparison or criticism of railroad affairs in Australia with that of other countries, due consideration must be given to the basic factors of population and the area to be traversed in serving the people.

I gather from Mr. Baghurst's very excellent paper that the good people of Australia are proceeding on the theory that the state should directly own, control and operate the railroads, various reasons being cited in support of this theory. It is to be assumed, as a matter of course, that our Australian friends have given due consideration and weight to the trend of railroad history in the United States and in some of the countries of Europe in recent years.

He also mentioned the importance of the railways to the development of the interior of Australia, such development being deemed essential before an immigration policy of magnitude could be launched. Unlike the United States, they are proceeding with their development through the medium of State owned roads. In our country we have had a marvelous growth under private ownership. In fact, the conditions would seem to be exactly reversed. In Australia they are giving thought to ways and means of increasing their population, while over here we recently adopted restrictive immigration laws. As between Australia and the United States, therefore, it will be interesting to keep in touch with the progress of affairs from a railroad viewpoint.

I was much interested in Mr. Baghurst's reference to "The Gauge Question." Some few years ago when the American roads were having their troubles with frequent periods of congestion, many and various suggestions were put forth as alleged "cures," one of which I recall recommended the adoption of a wider gauge as standard, the widths suggested ranging from 5′-3″ upwards. As everybody knows we are still sticking to the standard of 4′-8½″. As Colonel Nutt has stated, various gauges were operated in the early days of American railroading. In fact, in those days even where the gauges were uniform as between two or more connecting lines the Rules of Interchange as in effect necessitated transfer of lading at junction points, the ownership cars of one road not being permitted to go beyond owners rails. Nowadays, there is a free interchange between all roads and cars now go through from coast to coast or from Canada to the Gulf without transfer. It impresses me that with the varying gauges on Australian roads, the interchange of traffic as between the roads is somewhat of a problem, especially where there is a density via given junction points involving transfer of cars and lading. I did not follow Mr. Baghurst closely enough to gather whether the roads showing the better net returns are the so-called standard gauge lines, or whether they are the narrow or wide gauge roads. It would be interesting to know something about this and also as to the expense involved in transferring or adjusting cars containing traffic in transit as between roads of different gauges. Mention is made of this item of expense as having bearing on the estimated cost of $280,000,000 to bring all their roads to a standard gauge. In other words, would not this latter expenditure be justified and be offset by materially reduced cost of operations as now involved in the expense of transfer?

As Colonel Nutt has said, I am sure we have all been entertained and instructed in listening to Mr. Baghurst's paper and I am also quite sure that everyone present wishes well for the people of Australia and the successful working out of their policy of State owned railroads.

PRESIDENT HOWE: I would like to ask, what is the passenger rate per mile?

MR. BAGHURST: We have two classes. There is a first and a second class and the sleeping car service. Our second class works out approximately penny-farthing, that is about 2½c per mile. The first class works out around 75% on that figure. Our sleeping cars we generally charge one pound, that is about $4.75 for the use of that car for the run, in addition, of course, to the first class fare. You may get in the car at 5 o'clock one night and ride 24 hours, until 5 o'clock the next night, and that extra charge of $4.75 covers the whole period.

MR. A. E. ANDERSON: In adding to the appreciation expressed by the other gentlemen, I think the speaker has given the most detailed history of the development of the gauge question I have ever heard explained. It is interesting to realize that modern civilization has followed the rail of the coal wagon in the north of England as it was originally developed to what we call the standard gauge. We still have the difference in gauge between the standard railroad gauge and the standard street railway gauge.

Now it has occurred to me in these various discussions, and it comes up tonight, and I would like to ask the speaker his experience, why this gauge was adopted for the coal wagon in the north of England for hauling light loads, yet through all the development of the history of our railroad transportation, with all the engineering thought we have given to it, with all the laws and all the education both in the United States and in England and elsewhere and in Australia, that 4′-8½″ gauge holds its own. You would think with the enormous weights that have been hauled and that are put on that gauge today would make some modification.

Then that other question, whether from the experience of the speaker in Australia, and what appears almost approaching here, the time is not going to come, outside the question of cost, that it will be more economical to increase the gauge from that 4′-8½″ of the earlier days to 5′ or even 5′-3″ in order to more efficiently haul a greater load with greater economy. These are questions that come up to me every time I hear this gauge question discussed. We are piling up the weight of locomotives. Every design that comes out is still heavier than the last. I can remember very well when if you got above 40 tons with a locomotive it was a pretty big machine. Now we are going up to ten times that weight.

Following the line of appreciation, I would now move that a vote of thanks be extended to the speaker of the evening, to be acted upon at the proper time, for the very interesting and illuminating paper he has given us.

The motion was put to rising vote and was carried unanimously.

MR. BAGHURST: I think my thanks are to you, not yours to me. Since I have been in this country I do like to seize every opportunity to convey to you, as best I can, some little idea of what we are doing down under on the other side of the world. I feel very grateful for all the courtesies that have been shown me since I have been in this country and I shall go back to Australia with a very fine word for the American railroad engineers and supply men.

In answer to the question in regard to gauges I do not think the point raised has entered very largely into the decision in Australia for the adoption of the 4′-8½″ as against the 5′-3″. We find that, in New South Wales they are running both passenger and freight cars equally as big on their 4′-8½″ line as we are on our 5′-3″ lines. Again, take the South African lines, there they run 100,000 lb. capacity cars on a 3′-6″ gauge track and also passenger cars over 9′-0″ wide. The point that comes to my mind is the enormous capacity cars that would be possible had the 7′-0″ gauge been adopted and, I can well imagine the little braking problems that we should have controlling a long train of such cars down some of the very steep grades. The question of rail weights would be another interesting problem. We have enough troubles of our own today and I hesitate to think what we should let ourselves in for by the adoption of a 7′0″ gauge.

With regard to the question of whether wider gauges pay, the figures as laid down show that in South Australia, Victoria and New South Wales, the States with 4′-8½″ and 5′-3″ gauge lines pay better than the other railroads. In Tasmania, Queensland, and Western Australia with 3′-6″ gauge lines the railways have not been paying. In Western Australia, however, the last two years have turned a deficit into a substantial profit. It looks from those figures as though the larger gauges are paying better than the narrow ones.

MR. H. B. KELLY: I would like to ask what speed they make with their passenger trains. That might have something to do with the heavier equipment.

MR. BAGHURST: The speed of our trains is not so high in Australia as yours in this country. On our faster trains, we average something like 40 to 45 miles an hour, but I draw your attention to the fact that in England with light equipment they run equally as fast as your trains in this country. As a matter of fact, on the lines where I served my apprenticeship, the Great Western, they are running one on a daily schedule, of 77½ miles in 75 minutes, which compares very favorably with any of your fast passenger trains. Not only that, but on several roads they run what they call non-stop freight trains 117 miles in 3 hours and that will compare very favorably with your heavier equipment.

Whilst on the question of train-speeds the following, taken from schedules of the Great Western Railway of England, will be of interest:

Run	Distance Miles	Time Mins	Av. Speed M. P. H.
Swindon-London	77¼	75	61.8
London-Bath	107	105	61.1
London-Bristol	118¼	120	59.1
London-Exeter	173½	180	57.9
London-Plymouth	225½	247	54.8

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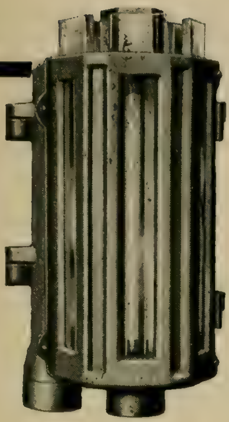

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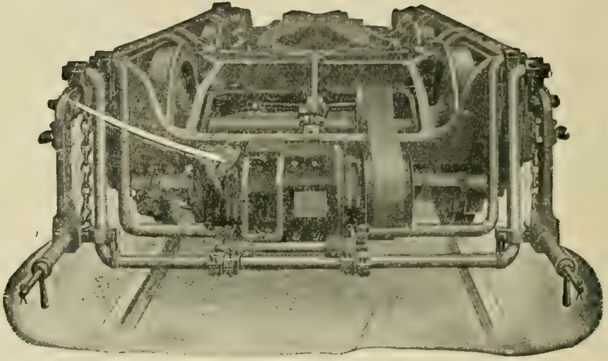

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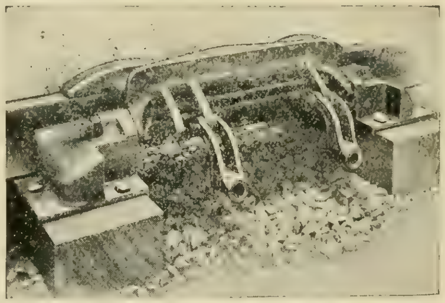

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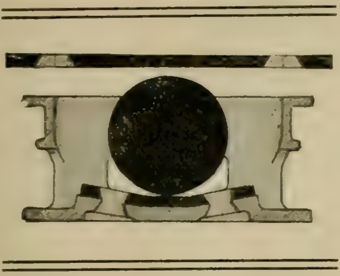

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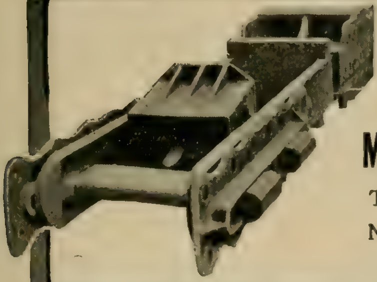

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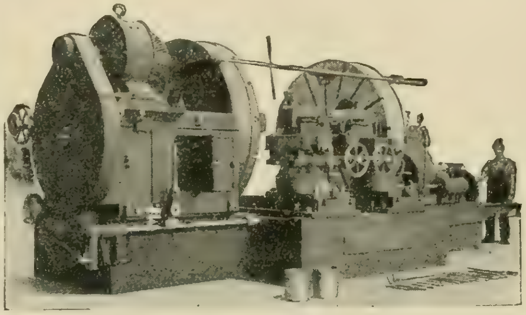

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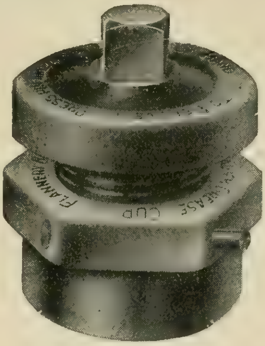

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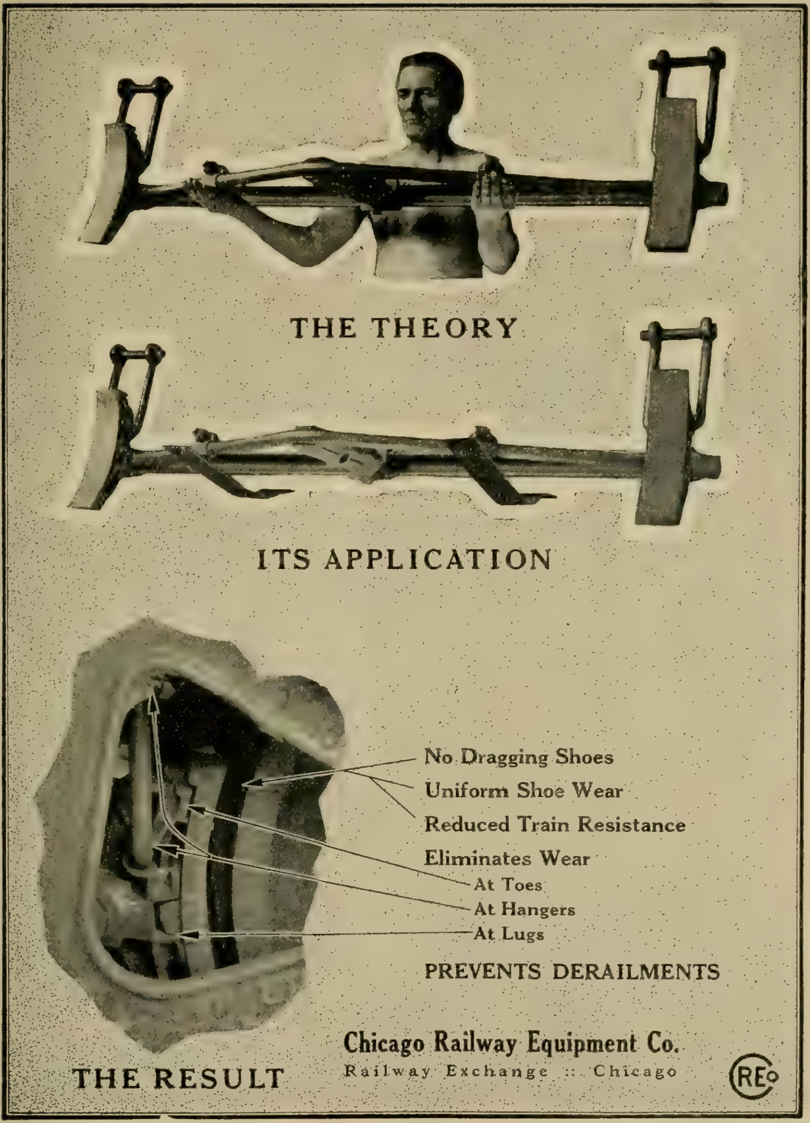
INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	viii
American Brake Shoe & Foundry Co.	iii
American Locomotive Co.	vi
American Steel Foundries	xvii
Baldwin Locomotive Works	viii
Ball Chemical Co.	v
The Bradford Corporation	ix
Brady Brass Co.	Front Cover
Chicago Railway Equip. Co.	xiii
Davis Brake Beam Co.	i
Dearborn Chemical Co.	iv
Flannery Bolt Co.	x
Fort Pitt Malleable Iron Co.	xi
Galena-Signal Oil Co.	xi
Gould Coupler Co.	ii
Graham Bolt & Nut Co.	Front Cover
Grip Nut Company	xix
Hagan, George J. Co.	Front Cover
Hunt-Spiller Mfg. Corporation	x
Johns-Manville, Inc.	xvi
Johnson Bronze Co.	i
Locomotive Stoker Co.	xv
McConway & Torley Co.	xv
National Malleable and Steel Castings Co.	iv
Niles-Bement-Pond Co.	vi
O'Brien, Martin J., Co., Incorporated	Front Cover
Paxton-Mitchell Co.	iv
Pgh. Testing Laboratory	Front Cover
Pressed Steel Car Co.	xix
The Q. & Co.	ii
Railway Equip't. and Publication Co.	iii
Railway Steel Spring Co.	xvi
Safety Car Heat. & Lighting Co.	xvi
Schaefer Equipment Co.	v
Sipe, James B., & Co.	iv
Southern Wheel Co.	iii
Standard Safety Nut Corp.	Front Cover
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	iii
The Superheater Co.	Front Cover
Suydam, M. B., Co.	Back Cover
The Symington Co.	v
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xviii
U. S. Metallic Packing Co.	xvi
Vapor Car Heating Co., Inc.	xviii
Westinghouse Air Brake Co.	vii
Westinghouse Elec. & Mfg. Co.	vii



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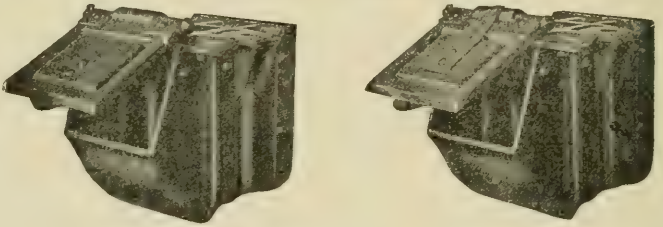

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D. J. REDDING	November, 1908, to October, 1910
F. R. McFEATTERS	November, 1910, to October, 1912
A. G. MITCHELL	November, 1912, to October, 1914
F. M. McNULTY	November, 1914, to October, 1916
J. G. CODE	November, 1916, to October, 1917
D. M. HOWE	November, 1917, to October, 1918
J. A. SPIELMANN	November, 1918, to October, 1919
H. H. MAXFIELD	November, 1919, to October, 1920
FRANK J. LANAHAN	November, 1920, to October, 1921
SAMUEL LYNN	November, 1921, to October, 1922
D. F. CRAWFORD	November, 1922, to October, 1923
GEORGE D. OGDEN	November, 1923, to October, 1924

*—Deceased.

Meetings held fourth Thursday of each month except June, July and August

PROCEEDINGS OF MEETING

March 26th, 1925.

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., at 8 o'clock P. M., Vice President F. G. Minnick in the chair.

The following gentlemen registered:

MEMBERS

Adams, W. A.
Anderson, A. E.
Armstrong, M. H.
Ashton, William A.
Baer, Harry L.
Ball, F. M.
Balzer, C. E.
Barrett, R. L.
Bednar, J. J.
Blume, W. A.
Borg, J. E.
Burk, G. C.
Buzzard, J. P.
Campbell, C. W.
Carlsson, John
Chase, C. N.
Chilcoat, H. E.
Christy, F. X.
Conlon, John F.
Conner, W. P.
Cox, William C.
Crawford, D. F.
Crenner, J. A.
Croke, Thomas F.
Dambach, C. O.
Davis, Charles S.
Dierker, R. H. L.
Durkin, James E.
Edwards, C. H.
Fults, J. H.
Furch, George J.
Gardner, K. C.
Gibson, D. W.
Gilg, Henry F.
Goda, P. H.
Greene, W. F.
Guignon, W. E.
Heinlein, George J.
Holmes, E. H.
Hoover, R. C.
Howe, D. M.
Huber, H. G.
Hughes, J. E.
Hulick, E. G.
Hussong, Albert C.
Joyce, S. F.
Joyce, Thomas J.
Jungbluth, Adolph
Karns, C. A.
Kennelly, D. F.
Ketchpel, Paul A.
Kilmer, George
King, C. F.
King, Jr., J. W.
King, O. B.
Kirkpatrick, H. F.
Kroske, J. F.
Lanahan, Frank J.
Lanahan, J. S.
Laughlin, R. J.
Laughner, C. L.
Laurent, G. F.
Laurent, Joseph A
Lawson, A. T.
Lobez, P. L.
Lohr, Allen W.
Lower, N. M.
Ludgate, B. A.
Lynde, L. E.
Lynn, Samuel
Maliphant, C. W.
Mann, N. T.
Manson, A. J.
Marshall, L. L.
Millikin, J.
Minnick, F. G.
Mitchell, Frank R.
Mitchell, William J.
Mitchell, W. S.
Moore, D. O.

McConnell, C. H.
McGarrigle, Joseph J.
McGeorge, D. W.
McLaughlin, Howard B.
Noble, J. A.
Norris, J. L.
Obermeir, L. J.
O'Neill, Thomas J.
Orchard, Charles
Orndorff, J. R.
Parke, F. H.
Pehrson, A. K.
Penn, William
Perkins, H. E.
Posteraro, S. F.
Proft, J. W.
Prouty, Eugene
Provost, S. W.
Purnell, C. S.
Ralston, J. A.
Rauschart, E. A.
Redding, D. J.
Redding, P. E.
Redding, R. D.
Reeve, George
Ritts, W. H.
Sattley, E. C.
Schrader, A. P.
Seibert, W. L.
Seiss, William C.
Sener, H. H.
Shannon, David E.
Shellenberger, H. M.
Snyder, Joseph
Spangler, C. P.
Stark, F. H.
Steigerwald, H.
Stewart, L. S.
Stoller, Karl M.
Sutherland, L.
Taylor, H. G.
Taylor, Joseph M.
Timme, W. F.
Tipton, G. M.
Tucker, J. L.
Van Vranken, S. E.
Walter, W. A.
Walther, G. C.
Ward, W. E.
Warrensford, Fred S.
Watt, G. R.
Webster, H. D.
Weissert, W. J.
Wildin, G. W.
Williams, W. G.
Winell, K. G.
Young, F. C.
Zilian, Ralph F.

VISITORS

Bales, William
Barry, Louis T.
Bats, John
Barton, C. M.
Butterworth, Joseph G.
Converse, E. M.
Cotter, George L.
Cunningham, C. G.
Curtis, F. F.
Denser, J. M.
Durgin, Lieut. C. T.
Graham, W. F.
Gyson, Alex
Hazer, Ross
Hill, William
Jex, W. A.
Johnson, William
Jungbluth, Herbert A.
Kamerer, R. W.
Kinnard, W. F.
Legge, J. H.
Lewis, L. H.
Lewis, Royal B.
Lewis, S. B.
McGann, J. F.
McNiff, John L.
Mok, F. H.
Pearce, Howard B.
Perley, A. D.
Poyntz, P. C.
Prouty, E. R.
Provost, William J.
Rowan, W. R. C.
Scott, W. L.
Shellaby, E. H.
Smythe, D. Verner
Snyder, W. H.
Stimpel, S. M.
Tallon, Howard B.
Talty, John A.

Thomas, George P.
Tucker, Ray A.
Tuttle, P. H.
Webster, J. F.
Wilson, Jr., J. C.
Whettemore, C. R.

The call of the Roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with, as they are to appear in printed form.

The Secretary read the following list of applications for membership:

Agnew, Robert L., Yard Master, Penna. R. R. System, 16 Shady Lane, Johnstown, Pa. Recommended by George J. Shultz.

Armstrong, M. H., Asst. Yard Master, Mon. Con. R. R. Co., 1028 Warrington Avenue, Pittsburgh, Pa. Recommended by C. M. White.

Bennett, Thomas R., Asst. Train Master, Mon. Con. R. R. Co., 509 Hays Avenue, Mt. Oliver, Pittsburgh, Pa. Recommended by C. M. White.

Colgan, Harry J., Asst. Train Master, Mon. Con. R. R. Co., 526 Farnsworth Street, Pittsburgh, Pa. Recommended by C. M. White.

Cotter, George L., Commercial Engineer, Westinghouse Air Brake Company, 353 Marguerite Avenue, Wilmerding, Pa. Recommended by N. T. Mann.

Emery, C. W., Train Master, Mon. Con. R. R. C., 2138 Hazel Avenue, Carrick, Pittsburgh, Pa. Recommended by C. M. White.

Farrington, Arthur R., Piece-work Inspector, P. & L. E. R. R. Co., 19 Singer Avenue, McKees Rocks, Pa. Recommended by Samuel Lynn.

Ferguson, R. B., Asst. Yard Master, Mon. Con. R. R. Co., 2 Alger Street, Pittsburgh, Pa. Recommended by C. M. White.

Geddes, James R., Asst. Superintendent, Mon. Con. R. R. Co., 3540 Second Avenue, Pittsburgh, Pa. Recommended by C. M. White.

Geyer, Harry M., Asst. Train Master, Mon. Con. R. R. Co., 105 Romeyn Street, Knoxville, Pittsburgh, Pa. Recommended by C. M. White.

Gorman, F. J., Asst. Yard Master, Mon. Con. R. R. Co., 500 Cato Street, Oakland, Pittsburgh, Pa. Recommended by C. M. White.

Jahnke, Karl W., Piece-work Inspector, P. & L. E. R. R. Co., 238 Singer Avenue, McKees Rocks, Pa. Recommended by Samuel Lynn.

Johnson, William E., Efficiency Clerk, Mon. Con. R. R. Co., 4637 Chance Street, Pittsburgh, Pa. Recommended by C. M. White.

Ladley, Bert, Yard Master, Mon. Con. R. R. Co., 1318 Alton Street, Pittsburgh, Pa. Recommended by C. M. White.

Legge, J. H., Yard Master, Mon. Con. R. R. Co., 3620 Frazier Street, Pittsburgh, Pa. Recommended by C. M. White.

Miller, George, Piece-work Inspector, P. & L. E. R. R. Co., 3228 Sacramento Street, Pittsburgh, Pa. Recommended by Samuel Lynn.

Miller, H. L., Piece-work Inspector, P. & L. E. R. R. Co., 923 Island Avenue, McKees Rocks, Pa. Recommended by Samuel Lynn.

McNally, H. J., Dispatcher, Mon. Con. R. R. Co., 318 Lawn Street, Pittsburgh, Pa. Recommended by C. M. White.

McNiff, John L., Yard Master, Mon. Con. R. R. Co., 625 Pegg Street, Pittsburgh, Pa. Recommended by C. M. White.

Rowan, W. R. C., Agency Inspector, Canada Life Assurance Company, Suite 452 Union Trust Building, Pittsburgh, Pa. Recommended by John Carlsson.

Smythe, Charles T., Yard Master, Mon. Con. R. R. Co., 56 Hazelwood Avenue, Pittsburgh, Pa. Recommended by C. M. White.

Spencer, Earle W., Yard Master, Mon. Con. R. R. Co., 218 Manson Street, Glenwood, Pittsburgh, Pa. Recommended by C. M. White.

Vanatta, Floyd, Yard Master, Mon. Con. R. R. Co., 316 Lawn Street, Pittsburgh, Pa. Recommended by C. M. White.

Weiss, K. C., Railroad Representative, A. M. Byers Company, Union Bank Building, Pittsburgh, Pa. Recommended by J. H. Ainsworth.

Wolfe, A. E., General Yard Master, Mon. Con. R. R. Co., 2027

Sarah Street, Pittsburgh, Pa. Recommended by C. M. White.

Wynn, E. M., Yard Master, Mon. Con. R. R. Co., 4831 Blair Street, Pittsburgh, Pa. Recommended by C. M. White.

VICE PRESIDENT MINNICK: These applications will be referred to the Executive Committee in due course, and upon approval by them, the gentlemen will become members without further action than the payment of the current year's dues.

The Secretary read an interesting letter from President Stucki, written at Kobe, Japan, requesting that his greetings from the Flowery Kingdom be conveyed to members of the club.

On motion, the Chairman and Secretary were directed to send by letter, cable or radiogram, a suitable response, assuring him of our appreciation of his letter and our sincere effort to carry on during his absence.

The Secretary announced the death of Leven J. Gwinn, of the Westinghouse Air Brake Company, 5759 Howe Street, East End, Pittsburgh, Pa., who died January 5, 1925.

VICE PRESIDENT MINNICK: Appropriate memorial will appear in the official Proceedings of the Club.

If there is no further business, the paper of the evening will be presented by Lieut. C. T. Durgin, U. S. Navy, Naval Aircraft Factory, U. S. Navy Yard. Philadelphia, Pa., on the subject: "Aerial Transportation." I take great pleasure in introducing Lieut. Durgin.

AERIAL TRANSPORTATION

By Lieut. C. T. Durgin, U. S. Navy.

One of the most important problems of aeronautics is the development of its commercial possibilities. The advancement in the aeronautical art since the beginning of the war leads us to believe that there is certainly some commercial field for aviation.

Already the airplane has many commercial uses; such as, photography, mapping, forest patrolling, transportation, and, I might mention rum-running. In this paper, however, I will touch only on that of aerial transportation. Its rapid progress since the war, as compared to other forms of aerial enterprises, has made it more nearly a commercial success.

Let us first examine in a general way the accomplishments obtained to date, both in design and operation of aircraft insofar as they bear upon its commercial possibilities. Then we will consider what has been demonstrated by these accomplishments.

From December 17th, 1903, when the first flight was made in an airplane by Orville Wright, until the start of the World War, aviation development was very slow, especially in this country. Very little interest was taken in this new science and, due to this indifference on the part of the American public and government, Wilbur Wright was forced to go to France for financial support in order to carry on his experiments. His flights there gave aviation in Europe the necessary impetus toward more rapid development.

The first Wright airplane had a maximum speed of 30 miles per hour, could remain in the air for 59 seconds and attain an altitude of 25 feet. These figures were not materially changed until five years later, when Wilbur Wright at Rheims, France, amazed the Europeans, who had been somewhat skeptical of the reported performance of the Wright airplane, by staying in the air for over two hours. The next year, 1909, the first aerial meet was held at Rheims, where a speed record of 47 miles per hour, an endurance record of four hours, and an altitude record of 500 feet were made. In this way, aviation continued to grow and by the start of the World War in 1914, there were airplanes available that could make 130 miles per hour, others that had an endurance of over 20 hours and still others that could reach an altitude of 20,000 feet. Advancement in the industry continued during the four years of war and since the armistice has gone on more rapidly than ever, both in commercial and military airplanes.

This gradual development has been due to better structural design methods, better aerodynamic characteristics of the airfoils or wings, and better engines.

Improvement in design has decreased the structural weight without sacrificing strength. Air resistance has been reduced by "cleaning up" of the structures; that is, eliminating or enclosing within the structure all parts possible that are not actually tending to lift the airplane. The benefit of these better design methods is shown in the comparison of the new PB type Navy seaplane with the NC type seaplane, which made the first transatlantic flight in May, 1919. The NC has a weight of 28,000 pounds and a cruising range of 1,600 miles, while the PB weighs 24,000 pounds and has a range of 2,400 miles, with a wing span of only 88 feet, as compared to a span of 126 feet for the NC.

The aerodynamic properties of many airfoils have been studied by means of wind tunnels and new airfoils designed having much better performance characteristics than the earlier wing sections. It was in this way that the thick, high lift wings, the Handley Page slotted wings and the racing wings were developed.

Improvements in engines has probably been the greatest single factor in the advancement of aviation. This can be seen when it is recalled that the first Wright engine developed only 16 horsepower, while airplanes are now using engines which develop over 800 horsepower. An interesting experiment was made in 1912 which demonstrated the importance of having sufficient power. Mr. Curtiss took Langley's old airplane, which had failed to fly in its final attempt just nine days before the Wright brothers made their first flight, and succeeded in flying it after refitting with a suitable engine.

Engine development has been along four major lines; increase in power and reliability, and decrease of weight and fuel consumption. Engines are now being used that develop over 800 horsepower and weigh only 1.4 pounds per horse power, as compared to 12.7 pounds per horse power for the original Wright engine. At the same time the fuel consumption has been decreased from 0.8 pounds per horsepower hour to 0.5 pounds per horsepower hour. This has been done with a continued increase in reliability.

Having considered briefly what has been accomplished in making the airplane a better machine, we will examine its commercial value when used as an aerial transport.

Aerial transportation was a logical sequel to the World War because existing aircraft, and there were thousands of various types available, were best adapted for this purpose. The first air transport company was formed in England in May, 1919, and used converted war airplanes. Shortly after this, numerous short routes were started both in France and England, followed by longer international routes. Most of these air lines were given liberal postal contracts and this, with a fairly large passenger traffic, enabled many of the companies to keep going. Like all new ventures, however, too many companies without proper organization or ability, were formed by selling stock to a gullible public. The result was loss of money and the acquisition of many "knockers." This was especially true in this country, where no government aid was given in the form of postal contracts.

All the European governments, realizing the military advantages of having a strong aeronautical industry and many trained pilots and mechanics available in case of war, gave large subsidies to many of the air transport companies. These subsidies are paid in accordance with some complicated formula depending on a number of factors; as, number of airplanes in use, passengers carried, pilots trained, miles flown, and ease of converting airplanes into military machines. While this policy of granting subsidies to air lines is keeping the aeronautical industry in Europe in a fairly strong condition and is training many pilots and mechanics, it is also nursing commercial aviation along so that even at this late date, six years after the first aerial transport company was formed, commercial aviation is not an economic success. The fact that European air lines are still unable to finance themselves without direct government subsidy even though they have operated over 30,000,000 miles, carried more than 200,000 passengers and over 60,000,000 pounds of mail and goods, show better than anything else that government nursing is the worst thing possible for aerial transportation.

In this country, where direct government subsidy is denied, the problem is to build up an industry that is entirely self-supporting except for the same sort of aid that has been or is given to rail and water transportation; that is, grants of land for landing fields and charting of air routes throughout the United States. This should not be such a difficult task for a country that possesses the organizing ability and engineering knowledge that has made the Air Mail Service, that incidently, flies twice as many miles each day as all the other air lines combined, the most efficient of all air lines and has designed, built and flown airplanes that hold practically all the world's records. A study of European air lines, notwithstanding the fact that they are not models of organization, can teach us much.

In the first place we find that the factors to be considered are both of a technical and an economic nature.

TECHNICAL FACTORS

These are the most important as proper types of aircraft must be available before much progress can be made in aerial transportation and furthermore, improvements can be made only as the technical details in design are developed.

Primarily, aerial transportation must be made safer, as it cannot gain the people's confidence and support unless the safety of flight is comparable to that of rail or water transportation. "Safety" must be the watchword of all and every effort should be put forth to reduce the possibility of accidents. Secondly, speed, being an essential asset to aerial transportation, must be increased. Not only speed through the air or speed from one landing field to another, but speed in taking passengers or goods from one business center to another.

In working towards this end for increased safety and increased speed, there are many factors to be considered; such as:

(a) Landing fields;
(b) Landing speed;
(c) Maximum speed;
(d) Percentage of useful load;
(e) Flight qualities with failure of power;
(f) Climbing ability;
(g) Ground organization.

I will discuss each of these factors separately:

(a) At the present stage of development, breakdowns are liable to occur and for this reason emergency fields must be established at intervals along the routes. The Air Mail Service finds that such fields are necessary at 25-mile intervals. As aircraft power plants become more reliable these fields can, to a great extent, be eliminated. Terminal fields should be larger and as near as possible, to the centers of business. This has not been done in many cases and as a result, the actual time of aerial transport is very little better than railroad time. New York City is one example of this handicap; the closest field to the center of the city is about an hour's ride by motor car. Locating terminal fields at such long distances from the centers of business makes short routes of no value as time savers. A trip from Pittsburgh to Cleveland by rail requires three hours and thirty minutes, while if, an airplane could start from Schenley Park in this city and land in Lakeside Park, in Cleveland, it would take only one hour and thirty minutes, a saving of two hours.

(b) Low landing speeds are essential, primarily, because there is still the possibility of a forced landing in a short, rough field and because of the decreased likelihood of stalling when there is a wide range between landing or stalling speed and maximum speed. Low landing speeds, while still retaining a high maximum speed, can be obtained in two ways: by increasing both the lift and the wing area. Both of these methods are used by birds when arching their wings and spreading their wing and tail feathers.

The lift of the wings may be changed either by using a variable cambered wing or a slotted wing. Both are being used, but are not as yet satisfactory on account of the structural difficulties involved. Increasing the area of the wings has also been tried, but with little success thus far.

(c) Inasmuch as speed is the essential commercial characteristic of the airplane, all effort must be made to increase it. Not only by building faster airplanes but, as I said before, by having landing fields closer to the centers of business. A good ground organization is absolutely necessary to expeditiously handle passengers and express.

(d) The useful load, that is, the pay load, which can be transported whether it is mail or goods or passengers, represents the only profitable parts of an organization. Therefore, it is necessary to decrease the weight of the structure and power plant to a minimum consistent with safety, to decrease the fuel consumption of the engine and to carry only the minimum weight of fuel and lubricating oil to accomplish with a margin of safety the scheduled trip.

(e) The question of flight qualities with failure of power is one that requires much study. Both the single-engined and the multi-engined aircraft have their advantages and disadvantages. If a multi-engined airplane is to be able to continue in level flight after failure of part of its power, it means that it must be lightly loaded with full power and is therefore uneconomical as a carrier. On the other hand, the fact that a multi-engined airplane which can remain in the air after failure of one engine, is less liable to forced landings, makes it unnecessary to design a heavy ship that can withstand the shock of hard landings in rough fields. One of the most recently designed commercial airplanes is said to have been made crash proof by enclosing the pilot and passengers in an armored cabin. The designer might have done much better by using two or more light engines and running them at part throttle. By doing this, forced landings would be eliminated and at the same time there would be a large surplus of power for taking off. Furthermore, the life of the engines would be increased, due to being operated at part throttle.

(f) Climbing ability in commercial aircraft is of very little value as long as it has the ability to take off quickly and climb above the surrounding buildings and trees.

(g) The Air Mail Service has been able to make its wonderful record for efficiency mainly because of its splendid ground organization. Several times as many man-hours are spent on keeping the engines in perfect condition, operating the signal system, marking and lighting the route, as are spent in the air. The ground organization is the secret of its success, and is a wonderful model for all aerial transport companies.

In addition to the above factors, there are many others that bear upon the safety and comfort of the passengers that should be given due consideration; namely, pilot's vision, radio installation for signalling, engine noises, location of windows, and ventilation of cabins.

ECONOMIC FACTORS

Under this sub-division falls such points as:

(a) Confidence of public;
(b) Operating costs;
(c) Length of haul;
(d) Air routes.

(a) Passengers will come forward to ride only after their confidence has been gained. This will take a long time and only actual accomplishments will inspire confidence in the public. The practice of the newspapers and magazines publishing stories telling of the intrepid pilots flying through fog and over rough seas or becoming dizzy and temporarily blind in making turns at high speed, certainly does not tend to make the man on the street want to fly.

Why is it that the press is so prone to headline crashes and feature stories which lead the readers to believe that an airplane is not safe unless piloted by a superman? With this kind of adverse advertising, statistics showing that the fatality rate per passenger mile is almost as low as that of railroads, will do very little good. As soon as the public learns that it does not require a superman to fly an airplane, but that it almost flies itself, there will be no lack of passenger traffic.

(b) Operating costs are dependent on so many factors that time does not permit me to do any more than point out some of the most important. Large scale operation is necessary if the cost per passenger mile is to be kept within reasonable limits. The time an airplane is kept in the air on productive flying must be kept a maximum. The time spent in the hangar or repair shop is an absolute loss, as is the time a freight car is left on a siding or a locomotive in a roundhouse, and must be reduced to a minimum.

The operating cost of the Air Mail in 1922 was 82 cents a mile; it was somewhat higher in 1923, but this was due to large expenditures for experimenting and building new aerodromes. The average cost of the Air Mail Service since May, 1918, has been less than 88 cents per mile. This will undoubtedly be lowered as better aircraft and engines are used, and as the mileage is increased.

(c) The length of haul necessary to make an air route of commercial value depends upon the time saved, especially the business hours saved, over rail or motor car. This, of course, will depend to a great extent on the distance of the terminal fields from the centers of business, the distance between cities, and whether or not airplanes are going to operate both by day and night. For example, the distance between New York and Chicago is about nine hours by air and about twenty hours by rail; a business day is lost in either case. If the airplanes were to operate at night, a business man could leave New York at 10 o'clock and arrive at Chicago before eight the next morning. Such a service would be of great value to many business men. An air lines between Pittsburgh and Chicago or New York could be operated by day, most profitably because a man could leave his office here at ten in the morning and arrive in either Chicago or New York during business hours in the afternoon.

(d) Air routes should first be established connecting large cities where, due to geographical location, the greatest time saving can be made over rail transportation. One such route is between Detroit and Cleveland. The Aeromarine Airways, Inc., have been operating over this route since June, 1922. It is worth noting that not a single person has been injured in the three years this line has been in operation.

Other especially good routes for air lines are between Los Angeles and San Francisco, and St. Louis and New Orleans.

There are other economic factors such as insurance, initial costs, passenger and freight rates. These factors, as in any transport enterprise, are of great importance and must be given much study. A discussion of these points, however, cannot very well be made because these factors will vary so much with air routes and operating conditions.

I have not touched on airship development because there has been very little aerial transport work done with lighter-than-air ships. Shortly after the war, the Germans operated for about three months a Zeppelin type rigid ship between Berlin and Lake Constance. Other than this there has been practically no commercial work done with airships.

There is undoubtedly a great field for large airships in trans-Atlantic and trans-Pacific transport. The recent flight from Germany of the LOS ANGELES and the cross-country trips of the SHENANDOAH have shown what can be done with this type of aircraft. Two ships of this type are now being built to carry 100 passengers and ten tons of goods from England to India at a speed of 50 miles per hour. These ships are of greatest use for trans-oceanic routes because no great altitude will be necessary, as in trans-continental routes, and because more time will be saved than in a trans-continental route.

CONCLUSIONS

It looks to me as if the way to make aerial transportation a success is to start operating on a large scale and continue to do so for a year or two whether or not passengers come forward to fly. Public confidence will eventually be inspired by the size of the enterprise better than in any other way.

This will take a large sum of money, but considering the advantages of aerial transportation it will undoubtedly result in a large profit ultimately. Men financially able and with vision enough to see the future benefit of being in on the ground floor should be "sold" the idea of developing aerial transportation, even at a temporary financial loss, in order to be in an advantageous position when the public realize the full importance of the airplane.

When this is done and when you business men who really know something about the economics of transportation get behind commercial aviation and put into it the fundamentals of business, aviation will then take its place along side of rail and water transportation.

BRIEF ANALYSIS OF COST OF AN AIR ROUTE BETWEEN PITTSBURGH AND PHILADELPHIA

The following analysis of a possible air route between Pittsburgh and Philadelphia is made in order to bring out more clearly the facts involved in making any air route an economic success.

It is assumed that a schedule of four trips each way per day (eight trips altogether), will be maintained, airplanes carrying eight passengers will be used, and that weather conditions will prevent flying on twenty-four days a year, thereby reducing the number of operating days to three hundred and forty-one.

The distance between Philadelphia and Pittsburgh is 250 miles by air and will require three hours and thirty minutes, allowance being made for motor connections between landing field and business center at each terminus. This is a saving of approximately five hours over railroad time. This saving would undoubtedly be of great value to business men, doctors and lawyers.

DIMENSIONS AND PERFORMANCE OF AN AIRPLANE SUITABLE FOR SERVICE BETWEEN PHILADELPHIA AND PITTSBURGH

Weight of airplane empty, lbs.	3,640
Total weight, lbs.	6,300
Useful load, lbs.	2,660
Fuel for 4 hours, lbs.	850
Lubricating oil, lbs.	70
Passengers, lbs.	1,320
Pilot, lbs.	165
Baggage, lbs.	255
Wing loading, lbs. per sq. ft.	10.5
Engine, Liberty, horsepower	400
Power Loading, lbs. per horsepower	15.8
Cruising speed, miles per hour	95
Maximum speed, miles per hour	115
Landing speed, miles per hour	52
Climb to 5,000 feet, min.	10
Gasoline consumption, lbs. per hour	210

Equipment Costs

Four airplanes and engines (operating)	$ 72,000.00
Two airplanes and engines (stand by)	36,000.00
One airplane and engine (overhaul)	18,000.00
Airplane spares	14,000.00
Three extra engines and spares	9,000.00
Materials	10,000.00
Hangars and equipment	12,500.00
Office equipment	1,500.00
Total equipment costs	$173,000.00

Direct Operating Costs

Airplane and airplane spares depreciation will be taken at 43% per year; engine and engine spares at 100%.

In figuring fuel costs, allowance is made for idling, testing and head winds.

Data from the Weather Bureau indicates that there will be an average of two days per month when fog or severe storms will prevent flying. Therefore, the total number of airplane miles flown will be:

Miles per day (8 times 250)	2,000
Hours per day	21
Miles per year (341 times 2,000)	682,000
Hours per year	7,161

Operating Costs

Three airplanes and engines (43% depreciation)	$ 54,000.00
Airplane spares (43% depreciation)	6,000.00
Engine and engine spares (100% depreciation)	30,000.00
Materials (50% replacements)	5,000.00
Gasoline	66,600 00
Oil	8,000.00
Total direct operating costs	$169,600.00

Overhead Costs

Six pilots at $3,600	$ 21,600.00
Sixteen mechanics	32,400.00
Two field managers, at $3,800	7,600.00
One general manager	6,000.00
Clerical force	4,000.00
Advertising	20,000.00
Insurance	25,000.00
Miscellaneous	25,000.00
Depreciation (hangar and office equipment)	2,500.00
Total overhead costs per year	$144,100.00
Total direct operating costs per year	169,600.00
Total	$313,700.00

Capital Required

Equipment	$173,000.00
Operating capital (50% yearly operating costs)	313,700.00
Reserve	13,300.00
Total capital required	$500,000.00

Total Yearly Costs

Direct operating costs	$169,600.00
Overhead	144,100.00
Interest on borrowed capital	40,000.00
Total	$353,700.00
Total number of trips made (8 times 341)	2,728
Cost per trip	$ 128.00
Cost per passenger per trip, assuming six per trip	21.34
Cost per mile flown	.52

Yearly Income and Profits

Assuming $25.00 per passenger, 6 passengers per trip, eight trips daily and 341 flying days per year:

Total number of trips made	2,728
Total passengers carried	16,368
Income from passengers, at $25.00	$409,200.00
Cost of operation	353,700.00
Profit on investment at rate of 11%	55,500.00

A charge of $25.00 is about $10.00 more than the charge by rail when Pullman is included, and is certainly not an excessive charge considering the fact that this is a time saving of five hours.

If full loads of eight passengers could be obtained for each trip, the fare could be reduced to $19.00 without lowering the per cent return on the investment.

VICE PRESIDENT MINNICK: You have heard what I believe is one of the most interesting papers ever presented before this Club. I do not think we need to fear airplane transportation interfering with steam transportation for some little time, but I do believe that in time to come it will fill a want that is felt even today.

It is customary following the reading of a paper for the Club to enter into a general discussion of the subject. Many of you may feel somewhat disqualified from taking part because of a limited knowledge of the subject, but I am sure the speaker will be glad to answer any questions that are put to him. And in order to start the ball rolling I would like to call on Mr. H. B. Pearce, President of the Aero Club of Pittsburgh.

MR. H. B. PEARCE: The speaker commented on the delays that occur between the point down town where you pick up your passengers and the point where you put them in the plane. Assuming that the route under discussion would be the Pittsburgh-Philadelphia route, do you think that a plane which could land on the water front at Philadelphia and land on the water front at Pittsburgh has reached such a state of development as to indicate that it would be a useful plane for such a route?

LIEUT. DURGIN: The pay load is the only useful part of the enterprise and an amphibian airplane carries too much extra weight at the present time. We may develop such an airplane that will not have so much weight in the extra parts; such as, landing gear and hull. At the present time, it would be of no commercial advantage because it would cut down the number of passengers that could be carried to two or three.

MR. A. E. ANDERSON: Taking the field that is proposed here, the Rodgers farm, would it be possible to have supplemental planes to carry the passengers from the city up there and cut down the automobile time.

Another question that I have not seen discussed very much is the question of resistance of the plane with the high velocities that are now being developed, upwards of 200 miles an hour. What effect will that have on the passengers, as well as on the plane itself, on the theory that the pressure increases with the square of the velocity.

On the question of confidence of the public on air lines, to which the speaker referred, that is an important matter, even though proof may be shown that it is safer than automobile travel. It may be interesting to put on the record that when they built the railroad bridge across the Firth of Forth people would not ride, until they finally induced Queen Victoria, in a special train, to cross that bridge, and when she had the courage to do it the common people felt that it was safe for them to travel. Following that same experiment they might induce the First Lady of the Land to take a trip on a mail plane across the continent or in some other way to show the public that it can have confidence in the safety of airplanes. But I think full publicity and not emphasizing accidents in the newspapers is the proper way to bring that information home to the public.

LIEUT. DURGIN: I question the practicability of having an airplane take off at the landing field, which is about eight miles away, and land on the river near the business section. That is entirely possible, but it would increase the overhead of the organization so much that there would be no chance to make it pay. It would be better to bring the passengers to the city in automobiles. By the time you unload the passengers, get them in the airplane, land on the water downtown and get them to shore, you would not save any time over motor car.

As to the increase of resistance with increase of the speed; in developing airplanes that go 277 miles an hour, air resistance has to be cut down by great refinement of detail. All the wires and other exposed parts must be streamlined. The designers have taken lessons from birds and have designed retractable landing gears which are pulled in the fuselage while in flight, just as the birds pull their feet up. All means possible are used to cut down resistance by enclosing or streamlining everything that does not tend to lift the airplane.

Speed has no effect on the passengers or the pilot. Anyone who can fly 50 miles per hour can fly 250 miles per hour just as easily, except that he must be more careful in landing.

MR. PEARCE: Articles in magazines are describing types of airplanes to take advantage of tops of buildings and such structures as train sheds, etc., for landing places. What do you think of the possibilities of that?

LIEUT. DURGIN: Eventually, that is bound to come. A Congressional Committee went to New York just a couple of months ago to investigate the possibility of putting a roof over the Pennsylvania Terminal and railroad tracks. This would give a wonderful landing field in the heart of New York City.

> NOTE: The questions poured in from this time on with such rapidity, and the answers followed so quickly, that it was not possible to get the names of all those who took part, and therefore all names are omitted.

QUESTION: This landing in the center of the city does not seem so important to us, but why wouldn't it be possible to drop the mail sacks on the top of the building with the platform there?

LIEUT. DURGIN: I suppose General Mitchell would say that it could be done very easily; he has great faith in his bombers. But it is not as easy to hit an object from the air as some people seem to think.

QUESTION: You have a fairly large building, but you do not need to be more than eight or ten feet above it.

LIEUT. DURGIN: That would limit the goods to be carried to non-breakable goods. The Marines worked out some war problems last summer down near Richmond, and one of the problems was to isolate a part of the infantry, as though it were surrounded by the enemy, and then keep the men provisioned by dropping food from airplanes. I suppose dropping of mail can be worked out in the same way, but it has not been done. Experiments have been going on to pick up mail while continuing in flight, but the air mail service has not seen fit to use it. Promably, it is not profitable to carry anything but full loads between terminal points.

QUESTION: Did you say 88 cents per mile is the estimated cost of commercial operation today?

LIEUT. DURGIN: On the air route between Philadelphia and Pittsburgh, I figured the cost per mile at 52 cents, but that assumes eight trips per day and operating 341 days a year. If the air mail can operate on 88 cents a mile, operating one airplane, leaving New York and one leaving San Francisco, certainly a commercial company could improve on that by operating on a larger scale. Their overhead would not be greatly increased if they operated three or four airplanes each way.

QUESTION: You showed a plane with eight passengers. Why did you choose that size?

LIEUT. DURGIN: Because, that is a commercial airplane that has recently been built, flown, and tested in Detroit; the one you have read that Henry Ford is going to sell for $5,000. The first one cost $125,000, the second $75,000, and so on down —I did not buy the first two or three.

QUESTION: At what price did you put the planes in your estimate?

LIEUT. DURGIN: $18,000. A commercial aircraft factory on the West Coast built an airplane of this type costing $20,000. Liberty engines, however, were not used in this airplane. Liberty engines can be purchased for $2,000. They originally cost about $8,000. The Army and Navy are not using them any more except on airplanes that have been designed around this type engine. Incidentally, those engines were selling for $150 three years ago and we could not get buyers for them. The rum-runners started their business and the price went up to $1,500, and is now $2,000. There is practically no market for airplane engines. The only use for them is in airplanes and racing boats. The rum-runners seem to want racing boats.

QUESTION: Some time ago I noticed in the Patent Gazette a patent for an airplane made with hollow wings and fuselage, where they introduced helium to hold it up. Does that seem practicable?

LIEUT. DURGIN: No. The contained space is so small that you would get practically no lift from it. Helium lifts about 60 pounds per 1,000 cubic feet, and there is not 1,000 cubic feet space inside the wings and the hull or fuselage of an airplane.

QUESTION: Regarding the question of landing on top of buildings we had a lecture Tuesday night from a New York architect showing pictures of the effect of zoning in New York, and if they keep on with their setback as they go on up in the air, there will not be room enough left to land an airplane.

QUESTION: In connection with the safety of airplane travel, can you give us some approximate figures as to the number of passengers that have been carried between London and Paris and the number of accidents? I was particularly interested in that service and I had opportunity to observe some of the planes moving and as I remember, they only had one or two serious accidents until quite recently.

LIEUT. DURGIN: Before the recent accident on the London-Paris route the fatality rate per passenger mile was about 2,660,000 passenger miles per fatality, which compares very well with the railroad rate along in 1912 and 1913.

QUESTION: This has been a very interesting talk, particularly so to me because I have made a discovery and established a fact. I find there is a modest man in the Navy, Mr. Durgin. I have a son who was at one time in the Navy and two cousins who are now in the Navy, and I find the Lieutenant was a classmate of my son in the Naval Academy. My son is not modest, I don't believe. I say the Lieutenant is modest because he asked me to read his second paper. I said "No," and then he said: "All right, I will read it myself." So I know he still has his nerve with him.

This has been a very interesting discussion. It has been rather technical for me, but I am just wondering if the Lieutenant could bring out some of the high lights on the trip around the world by the Army planes. We have all read a lot about it in more or less technical magazines, and I think he could bring out some of the high lights on it that would be very interesting to us.

LIEUT. DURGIN: I thank Col. Milligan for the compliment. I think most of the Naval officers are modest. I remember that there was a great deal of regret when we saw "Sammy" Milligan leave us.

As for high lights on the recent around-the-world flight of the Army aviators, I cannot say any more than you have already read. It has been so highly advertised that there is little left to say about it. But I can give you one point which will show that aircraft are still very much dependent upon surface ships. In the flight around the world, the Army aviators flew about 23,000 miles; the Navy ships escorting them, steamed 136,000 miles. That was one of the big arguments that the Navy General Board at Washington used to show that aircraft was still dependent on surface ships and therefore should not be separated from the Navy. I think their reasoning is very good.

VICE PRESIDENT MINNICK: I would like to call attention to one thing in connection with the apparent discouragement of Lieut. Durgin due to the attitude of the press, which he felt was somewhat derogatory in its attitude toward the airplane endeavor, because of the fact that it played up injuries and fatalities. Many of us in the room are railroad men, and we know that a railroad will operate successfully for months and months and the newspapers pay little attention to it, but if we happen to have a little hard luck the newspapers play up the unfortunate incident. I feel that the men in government service and outside of it will not permit the discouraging feature of the newspapers to lead us away from the essential success of the airplane service, and you may take some comfort out of the fact that the airplanes are not the only ones that the newspapers go after when there is a little run of hard luck.

We have in the room tonight a young man who is an officer in the Pittsburgh & Lake Erie Railroad and who, to my surprise, knows something about airplanes. As a matter of fact, he served as a lieutenant of aviation and is now a member of the organized aviation reserve, Mr. Robert Redding. May we hear from him?

MR. ROBERT REDDING: After hearing the Lieutenant's speech I realize I am pretty well outclassed. I had a little air service and as said at the dinner, it was 98% enthusiasm and 2% aviaton. I note the Lieutenant has pointed out the commercial possibilities of the Pittsburgh and Philadelphia air route. I have talked with a member of my family of the Pittsburgh and Chicago air route, and I would now like to ask Lieut. Durgin what his opinion is of the commercial possibility of such a route.

LIEUT. DURGIN: I believe the Pittsburgh-Chicago route is as practicable as the Pittsburgh-Philadelphia route. Pittsburgh is about midway between Philadelphia and Chicago. What is true of the route between Philadelphia and Pittsburgh is probably true of the route between Pittsburgh and Chicago.

QUESTION: About three years ago I believe there was an actual head-on collision between two planes on the London-Paris route. That brings up the question of the possibility of air collisions, during fogs, for instance, and whether they can be avoided.

On the question of the newspapers, we must not criticize the newspapers too severely. The very fact that you run your roads for months without a word in the newspapers shows that you are handlng your business so well that it does not require any comment and therefore the newspapers hadn't anything to say about it. Virtue is so common among us that it does not require any comment, and vice is so unusual that it brings scare headlines when it does occur.

LIEUT. DURGIN: I do not recall any collision in the air between air transportation company airplanes. I see no reason why there should be collisions because air transportation, the same as water transportation, should follow certain routes going in one direction and other routes going in the other direction. Steamers between New York and Liverpool going in one direction, take the northern route, and in the other direction the southern route, with some 200 or 300 miles between the routes. There are quite a number of collisions in the air between Army and Navy plans, but they fly close intentionally and take that chance.

QUESTION: You said you thought organized commercial aviation would open the way to aerial transportation. Does it not go back just a little farther than to the matter of landing fields. If they organized a company today, could they operate successfully with the requirement of landing fields every twenty-five miles, due to the present character of equipment. Wouldn't it largely depend on having these landing fields every twenty-five miles?

LIEUT. DURGIN: Absolutely. What we need in aviation right now is government regulation. We should have such a bill as the Winslow Bill, which licenses pilots and aircraft. Insurance rates should be given. We should have airports close to the centers of business. Cities are trying more and more to get air ports closer to the business centers. Camden is taking advantage of the fact that Philadelphia is building an air port 35 minutes from the City Hall by building an air port in the city limits of Camden, which is only 12 minutes from the City Hall in Philadelphia. As soon as the cities realize commercial aviation is bound to come, they will put air ports close to the centers of business. I would recommend Schenley Park for Pittsburgh.

QUESTION: What do you think of the possibilities of dirigibles and similar types of aircraft?

LIEUT. DURGIN: Dirigibles have greater possibilities than airplanes. In building an airplane the amount it can lift goes up as the square of the dimensions; the weight of the airplane goes up as the cube of the dimensions. It can be easily seen there will be some point where the airplane cannot carry any more than its structural weight; no lift will be available for carrying any useful load. In a dirigible it is just the reverse; the amount it can lift goes up with the cube of the dimensions, as does the weight of the structure. In building larger structures, however, they can be made lighter in proportion to their size on account of being able to go into more detail of design and in this way increase the percentage of useful load.

In trans-continental routes for dirigibles, there is not much possibility for their commercial use for years to come. They have to cross the Rockies and in order to reach that height they must either release quite a great deal of gas or start with less than a full load of gas. This cuts down the total amount of useful load that can be carried. A trans-Atlantic line is entirely feasible and will probably be in operation before many years.

The Goodyear Company evdently believes in the commercial possibilities of dirigibles, as they have brought over quite a number of German workmen from the Zeppelin works, to build a 5,000,000 cubic feet rigid ship, twice as large as the SHENANDOAH, and able to carry 75 tons useful load.

QUESTION: We read a good deal about gliders and planes that wll ascend vertically. Are there any practical possibilities in connection with these?

LIEUT. DURGIN: There are no commercial possibilities for a glider except as a sport plane, for it has to go wherever the wind takes it. It soars along, taking advantage of the upward air currents.

As to the helicopter, there is a great practical use for it. If it could be developed it could take off from a small space like your own back yard and go up in the air 50 or 100 feet and then start flying just like an airplane. As far as practically obtaining that, we have still a long ways to go. But progress is being made and records are being broken every day. As yet, no one has gone up over 30 or 40 feet and practcally all helicopters are very hard to control. Probably we will develop them some day to a point where they can be used by all of us.

QUESTION: How long does it take to train a pilot up to the advance stage?

LIEUT. DURGIN: Eddie Stinson, one of the best commercial pilots, learned to fly in an hour and a half. The average time required is between 10 and 12 hours in the air.

QUESTION: You spoke of the necessity of fields between stations about 25 miles apart. What is the distance a plane can glide after the engine goes dead?

LIEUT. DURGIN: That depends on the type of airplane entirely. Some airplanes are made with a gliding angle of 18 to 1, and others as low as 5 to 1. The racing machines, which have very small wing area, with heavy loading, have a very steep gliding angle. But the idea of having landing fields every 25 miles is not that the airplane will always be within gliding distance of the field, but to have fields at intervals for emergency repairs. Airplanes seldom have a breakdown that causes them to land immediately.

QUESTION: It would mean being able to glide 12½ miles.

LIEUT. DURGIN: To do that they would have to be up from a mile and a half to two miles.

QUESTION: You spoke about German designers coming over with the Goodyear people. Are there not designers in America capable of handling that kind of work? It will not be long until young men will be thinking of going into that kind of work and will want to know how to get located in that kind of work. None of the colleges are teachng that yet, are they?

LIEUT. DURGIN: The Goodyear brought over the German workmen because they were the only ones, except those in the service of the U. S. Navy, that knew anything about building rigid ships.

As to the second part of the question, there is now a course in Aeronautical Engineering at the Massachusetts Institute of Technology.

QUESTION: It has been my experience that the average person thinks that the moment you get up 1,000 or 2,000 feet and look over the sde of the ship you become dizzy, just as in looking down from the top of a tall building. Is that correct?

LIEUT. DURGIN: Almost everybody, except steeplejacks, get dizzy when they look over the side of a building. Probably we would feel the same way in an airplane if we were not sitting down comfortably and well protected. I get dizzy when I look over the top of a high building, but never when I look over the side of an airplane.

QUESTION: In looking down from a tall building you have something to compare your heighth with; in an airplane you have nothing to make any comparison with and you do not realize the heighth. Isn't it a mental state?

LIEUT. DURGIN: One can realize, however, the distance he is above the ground. If you are up four or five hundred feet, the tops of the buildings can be seen just below and the tops of the buildings are all pretty high places from which to fall.

QUESTION: We had a discussion as to whether in the Pulitzer races the Navy planes landed at 75 miles an hour.

Lieut. DURGIN: The Pulitzer rules say the airplanes must land at less than 70 miles an hour. They are designed to do that, but the pilots probably do not do it; they land at 75 or 80 miles an hour. Very few pilots land an airplane at its lowest landing speed.

QUESTION: What was the reason for the round-the-world flight?

LIEUT. DURGIN: To beat the Navy. The Navy is now planning a trip from San Francisco to Hawaii. One reason is to beat the Army. Competition like this is a good thing. It is necessary to have some competition in a new enterprise such as aviation and there is plenty of it between the Army and Navy.

QUESTION: Is it feasible for the Federal government to establish beacon lights similar to light houses?

LIEUT. DURGIN: They have done that on the air mail routes. They have not done it any place else, but probably will when aviation gets started on a large scale. The air mail has beacon lights about every five or six miles, a larger one every twenty-five miles and a still larger one at the terminal fields. Charting of air routes and granting of land for landing fields are about the most important aid we expect or want from the government. Commercial aviation is better off without a direct government subsidy.

QUESTION: On the question of comparison of speed, watching a moving object and being on an object that is moving makes quite a difference in judgment. In discussing an accident some time ago a railroad official told me that if the engineer said he was going 15 miles an hour you can double that. Is there such an effect on aviators' ability to judge their speed when flying, particularly when they come to land?

LIEUT. DURGIN: We have an instrument which tells the speed through the air, speed relative to the wind. If we are bucking a twenty-mile breeze and the airplane speed is sixty miles, that means that we are landing on the ground at forty miles an hour. If it was in the other direction, we would be going eighty miles an hour; but aviators, the same as birds, do not land with the wind, they land into it. As far as judging the land speed over the ground is concerned, they do not try to do it, they tell by the feel of the airplane when it has reached its landing speed.

QUESTION: I understand, at Harrisburg, they contemplate the establishment of an aircraft investigation board. Do you have any information as to what they contemplate accomplishing?

LIEUT. DURGIN: I do not know anything about it. I had not heard it before.

QUESTION: You mentioned flying by night, carrying passengers. What have you in mind to take care of the passenger?

LIEUT. DURGIN: We will furnish bunks for them the same as in Pullman cars.

QUESTION: Would that not cut down the capacity?

LIEUT. DURGIN: It would to some extent.

QUESTION: In your figures of cost between here and Philadelphia, you call for landing fields every 25 miles; you allowed 24 days for bad weather and calculated on three trips a day each way the other days. If you could do that the landing fields would vanish; if not, you must calculate something for picking up passengers.

LIEUT. DURGIN: I put in a large sum ($25,000) for insurance, and allowed for a depreciation of 43% on airplanes and airplane spares. That is three airplanes a year. An analysis of the crashes of a European air line, give airplanes an expected life of over 10,000 hours; that would indicate that an airplane on the Pittsburgh-Philadelphia route could operate about nine years before being wiped out in a crash.

QUESTION: What is the principal cause of airplane failure and what means could be taken to prevent it in the future?

LIEUT. DURGIN: Practically all accidents in commercial aircraft are due to engine failure and we are doing our best to make engines more reliable. The Navy does not accept engines from the builders unless they can pass an endurance test of 300 hours. The acceptance test used to be only 50 hours. This makes the designers and builders make them a great deal stronger and for that reason they are more reliable.

QUESTION: You spoke of the J. L. Lawrence machine. Is it more efficient?

LIEUT. DURGIN: I do not know in detail the performance characteristics of the old Junker machine. I do know, howeven, that the Stout Air Pullman is very much better. The new Packard 1A-1500 develops 100 horsepower more than the Liberty motor, weighs 140 pounds less, has a smaller fuel consumption, and smaller overall dimensions. With this engine, instead of the Liberty engine, the Stout Air Pullman has a pay load of 2,000 pounds instead of 1,000 pounds, or a range of 960 miles, as compared with 420 miles when the Liberty engine is used. This shows what has been done in engine development. The Packard engine is a new engine now being used by both the Army and Navy, and is the one the Navy will use in its flight from San Francisco to Hawaii.

MR. D. J. REDDING: We have listened to a most interesting and instructive paper and discussion, one of the most interesting and instructive we have ever had. And we have subjected the Lieutenant to more cross-examination than is customary and he must be tired. He has answered all the questions that were asked him, satisfactorily to those who asked them, and I want to move that a vote of thanks be given him for his very able paper.

LIEUT. DURGIN: Before the discussion is closed, may I ask two questions myself? I would like to ask Mr. Pearce if he can get this aviation investigating committee at Harrisburg to make some arrangement for the chartering of air routes. That is absolutely necessary; no company will start development unless they can get a charter giving exclusive rights to run over a certain route for a certain number of years.

MR. PEARCE: I think the suggestion is very good, and I will send it down to the proper person.

LIEUT. DURGIN: Then I would like to hear from someone of you whether or not it would be of any use to a business man to be in Pittsburgh up to 10 o'clock in the morning, and in Philadelphia or Chicago before business closes in the afternoon? If there is no commercial demand for that, an air route between Pittsburgh and Philadelphia will certainly not be a profitable enterprise.

MR. D. J. REDDING: I might explain to the Lieutenant that this is possibly not the best place to get that information, as the majority of us are railroad men and travel on free transportation. If you give passes on your air lines, you will get lots of people.

MR. F. J. LANAHAN: The only way to answer that question is that Pittsburghers do not want to go to Philadelphia; they have to go there occasionally. As far as the commercial end of the question is concerned, I think it has some advantages.

It would take a little study and analysis and data from a number of sources to make it of value to Lieut. Durgin, and I will be glad to take it up with a number of people and give him their answer, together with such comments as I may be able to add.

While I am on my feet a word may be opportune on the subject of newspaper publicity. I think it was Mr. Brisbane who said, if a dog bit a man that would not be news, and there would not be anything in the papers about it the next day. It is an ordinary matter. But if the man bit the dog, it would come in the next day because it is a news item; it is out of the ordinary. If you should have anything happen on the P. & L. E. in the way of a wreck, it would be a news item, and it would be worthy of comment on the part of the entire press.

There is another phase of this discussion which I must be personal to mention. As American citizens who love their country and know the representatives that have gone to West Point and Annapolis, though generally we only know them in a hazy way, for we do not often come in contact with them, but I think everyone here tonight has been gazing at the speaker, not alone his manly proportions and genial smile, but the intelligent manner in which he has presented his subject, and it makes us proud of our soldiers and our sailors, and I cannot help but be affected and I feel that this country of ours is safe with its defense in the hands of such men. It has been a wonderful evening. While Mr. Redding has moved a vote of thanks and it has been seconded, I dare say that every one of the rest of us here want to subscribe our gratitude to Lieut. Durgin and wish him a continued success and tell him what a bully evening he has given us.

The motion for a vote of thanks was adopted by unanimous, rising vote.

Upon motion, adjourned.

J. D. CONWAY,
Secretary.

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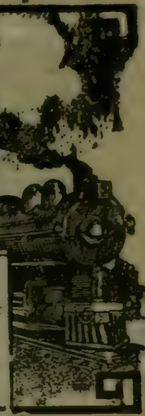

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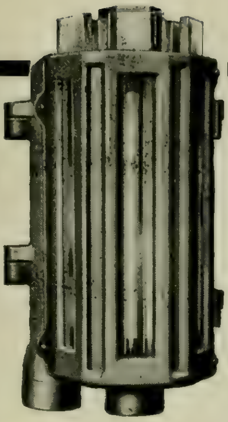

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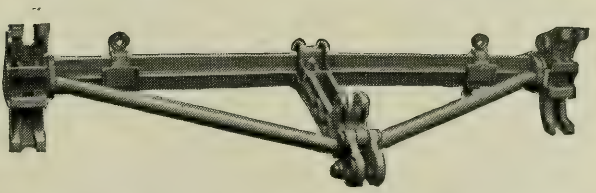

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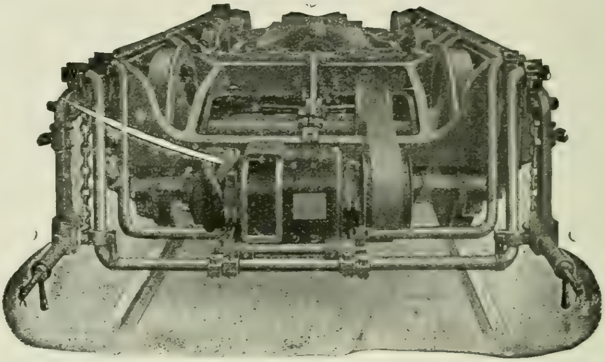

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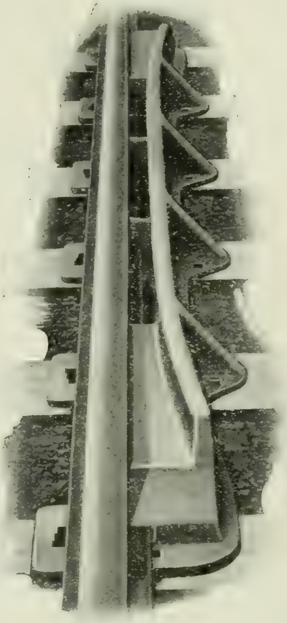

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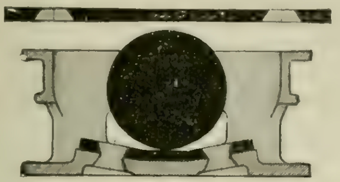

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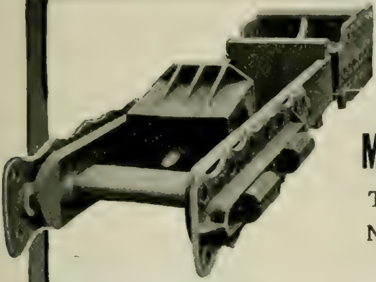

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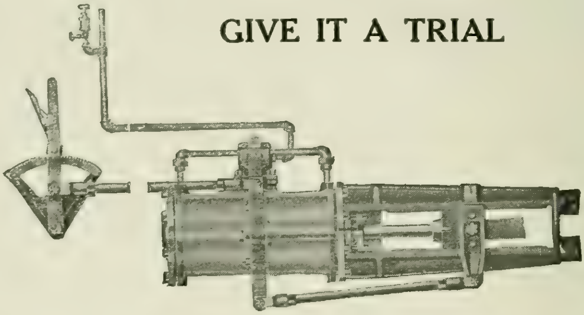

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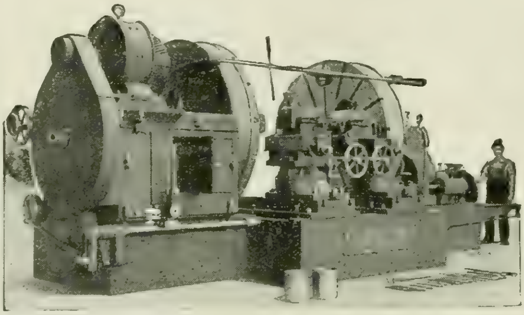

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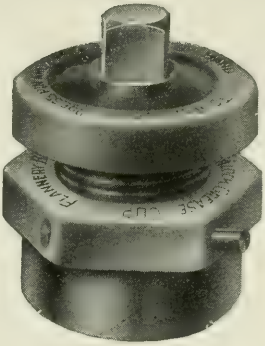

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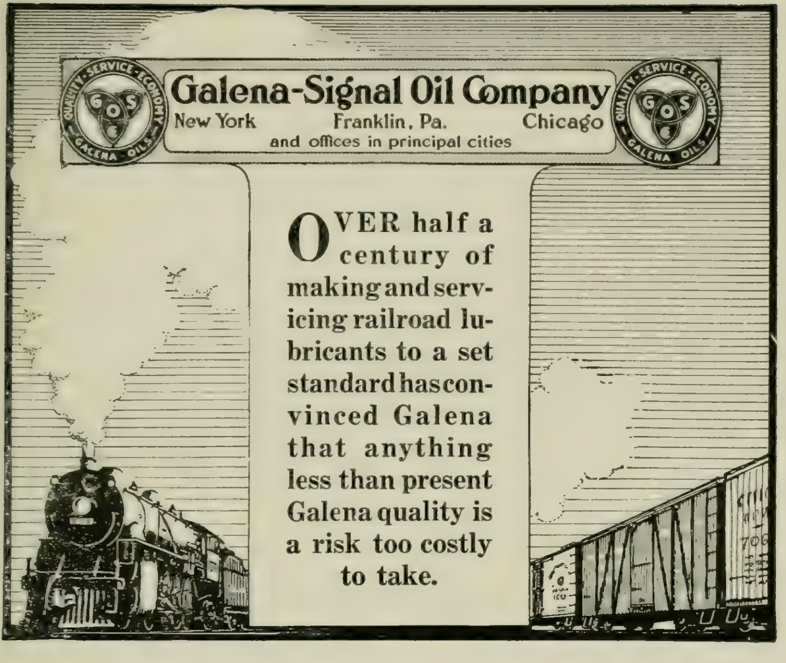

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INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	viii
American Brake Shoe & Foundry Co.	iii
American Locomotive Co.	vi
American Steel Foundries	xvii
Baldwin Locomotive Works	viii
Ball Chemical Co.	v
The Bradford Corporation	ix
Brady Brass Co.	Front Cover
Chicago Railway Equip. Co.	xiii
Davis Brake Beam Co.	i
Dearborn Chemical Co.	iv
Flannery Bolt Co.	x
Fort Pitt Malleable Iron Co.	xi
Galena-Signal Oil Co.	xi
The Gould Coupler Co.	ii
Graham Bolt & Nut Co.	Front Cover
Grip Nut Company	xix
Hagan, George J. Co.	Front Cover
Hunt-Spiller Mfg. Corporation	x
Johns-Manville, Inc.	xvi
Johnson Bronze Co.	i
Locomotive Stoker Co.	xv
McConway & Torley Co.	xv
National Malleable and Steel Castings Co.	iv
Niles-Bement-Pond Co.	vi
O'Brien, Martin J., Co., Incorporated	Front Cover
Paxton-Mitchell Co.	iv
Pgh. Testing Laboratory	Front Cover
Pressed Steel Car Co.	xix
The Q. & Co.	ii
Railway Equip't. and Publication Co.	iii
Railway Steel Spring Co.	xvi
Safety Car Heat. & Lighting Co.	xvi
Schaefer Equipment Co.	v
Sipe, James B., & Co.	iv
Southern Wheel Co.	iii
Standard Safety Nut Corp.	Front Cover
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	iii
The Superheater Co.	Front Cover
Suydam, M. B., Co.	Back Cover
The Symington Co.	v
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xviii
U. S. Metallic Packing Co.	xvi
Vapor Car Heating Co., Inc.	xviii
Westinghouse Air Brake Co.	vii
Westinghouse Elec. & Mfg. Co.	vii

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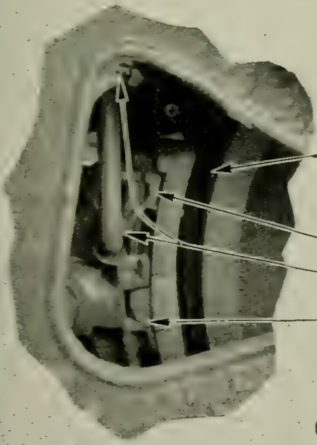

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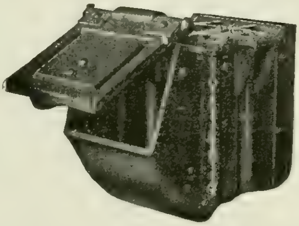

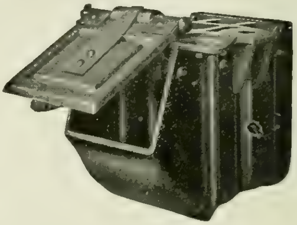

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*—Deceased.

Meetings held fourth Thursday of each month except June, July and August.

PROCEEDINGS OF MEETING

April 23rd, 1925.

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., at 8 o'clock, P. M., Second Vice President G. W. Wildin in the Chair.

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Ainsworth, J. H.
Anderson, A. E.
Bean, E. J.
Bednar, J. J.
Berg, K.
Bingham, George H.
Braun, O. F.
Burk, G. C.
Buffington, W P.
Chase, C. N.
Christy, F. X.
Conner, W. P.
O'Conor, M. J.
Cooper, J. P.
Cotter, George L.
Courtney, H.
Crenner, J. A.
Croft, C. A.
Cruikshank, J. C.
Dambach, C. O.
Davis, Charles S.
Dierker, R. H.
Durkin, James E.
Emery, E
Farrington, Arthur R.
Farrington, Robert J.
Fisher, J. J.
Fowler, Jr., W. E.
Freshwater, F. H.
Fritz, A. A.
Fults, J. H.
Furch, G. J.
Geddes, James R.
Gellatly, William R.
Gilg, Henry F.
Gillespie, W. J
Glenn, J. H.
Goda, P. H.
Greene, W. F.
Hansen, William C.
Harris, C. A.
Headington, R. V.
Herrold, A. E.
Holmes, E. H.
Hoover, R. C.
Hudson, W. L.
Hulick, E. G
Johnson, Nelson E.
Joyce, S. F
Joyce, Thomas J.
Jungbluth, Adolph
Karns, C. A.
Kennelly, D. F.
King, Jr., J. W.
Kunkel, H. C.
Laughlin, Harry
Lawson, A. F.
Lobez, P. L.
Lohr, Allen W.
Lynn, Samuel
Mann, N. T.
Matchett, H. K.
Millar, Clarence W.
Miller, George
Miller, H. L.
Mitchell, F. K.
Mitchell, W. T.
Mitchell, W. S.
Morgan, A. L.
Morris, J. H.
Moyer, Oscar, G. A
Muir, R. Y
McGirk, John D
McLaughlin, H. B.
O'Leary, T. J.
O'Neill, Thomas J.
Orchard, Charles
Patterson, J. E.
Paul, Lesley C.

Penn. William
Perry. W. E.
Purnell, C. S.
Rabold. W. E.
Ralston, J. A.
Rauschart, E. A.
Redding. D. J.
Redding, P. E.
Richardson. H. R.
Riddle. D. E.
Ridgeway, J. F.
Roberts, J. E.
Rogan, J. A.
Rowan, W. R. C.
Ryan, William F.
Saltic. Thomas
Sawyer, Ralph
Schrader. A. P.
Sener. H. H.
Severn. A. B.
Shellenbarger, H. M.
Smith. John L.
Smith. R. H.
Snowden. Howard. J.
Spangler. Charles P.
Sparks. Hynes
Steigerwald, H.
Stewart. L. S.
Sutherland. L.
Taylor, H. G.
Tucker. John L.
Walter. W. A.
Warrensford, Fred S.
Weissert, W. J.
Wildin, George W.
Williams. N. G.
Winslow, S. H.
Wright, John B.
Wynn. E. M.

VISITORS

Angstadt, Edward D.
Benson, G. Milton
Boyd, George E.
Branagen, J. P.
Bull. R. S.
Chalfant. Charles
Church, I. E.
Converse. E. M.
Croft, J. M.
Crow. A. E.
Eberle. Fred H.
Fisher. W. R.
Galbraith. Edward
Hilstrom. A. V.
Jex, W. A.
Joyce, J. J.
Jungbluth, Herbert A.
Keller, Joseph
Ketterer. C. L.
Ketterer. F. S.
Keyser. R. H.
Kuhn. C. A.
Larned. J. M.
Lewis. S. B.
Mann, Henry S.
Murphy, E. S.
Musgrove, W. W.
McKinley, Archibald J.
McPherson. K. W.
McVicker, C. L.
Patterson. Robert T.
Rider. H. C.
Rossell, W. T.
Salzburg, R. J.
Slater, J. E.
Smythe, D. V.
Trautman. W. W.
Vogel, L. C.
Wallace. H. L.
Watson. W. A.
Williams. Oscar
Woodling, George V.

The call of the roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with, as they are to appear in printed form.

The Secretary read the following list of applications for membership:

Croft, C. A., Railroad Representative, A. M. Byers Company, 410 Union Bank Building, Pittsburgh, Pa. Recommended by J. H. Ainsworth.

Lingle, Charles M., General Yard Master, P. & L. E. R. R. Co., Dawson, Pa. Recommended by H. B. McLaughlin.

Lollenger, J. C., Yard Master, Mon. Con. R. R. Co., 600 Doyle avenue, West Homestead, Pa. Recommended by C. M. White.

Mann, Henry S., District Sales Manager, Standard Stoker Company, Inc., 1943 McCormick Building, Chicago, Ill. Recommended by D. J. Redding.

Simpkins, Fred E., Freight Movement Director, Pennsylvania Railroad System, 807 Wood Street, Wilkinsburg, Pa. Recommended by Robert L. Agnew.

Stracham, M. B., Yard Master, Mon. Con. R. R. Co., 2805 Stracham Avenue, Dormont, Pittsburgh, Pa. Recommended by C. M. White.

Whipple, A. L., Representative, Locomotive Stoker Company, 150 Broadway, New York, N. Y. Recommended by N. M. Lower.

Wynn, M. E., Yard Master, Mon. Con. R. R. Co., 3732 Orpwood Street, Oakland, Pittsburgh, Pa. Recommended by C. M. White.

SECOND VICE PRESIDENT WILDIN: These applications will be referred to the Executive Committee in due course, and upon approval by them, the gentlemen will become members without further action than the payment of the current year's dues.

The Secretary announced the death of Past President F. M. McNulty, who died April 6th, 1925; and who had served as President of the Club from November, 1914, to October, 1916.

SECOND VICE PRESIDENT WILDIN: Appropriate memorial will appear in the Official Proceedings of the Club.

The Secretary called attention of the Members to the invitation extended by the Westinghouse Electric & Manufacturing Company, to visit their works April 30th, 1925, to inspect some electric locomotives; the inspection to be followed by a complimentary dinner at the plant, at which a discussion would be had on what was seen.

Announcement was made of time and place to meet, for the purpose of going to the Westinghouse works.

SECOND VICE PRESIDENT WILDIN: There being no further business, it gives me pleasure to introduce to you Mr. A. P. Schrader, Manager Steam Railroad Section of the Transportation Division of Westinghouse Electric & Manufacturing Company, who will say a few words regarding the April 30th trip to their works.

MR. A. P. SCHRADER: We have arranged for a party to arrive at our works later in the afternoon for the benefit of those unable to join the earlier party. The early group will have an opportunity of seeing some very large machine tools in operation, and also some equipment of unusual size under construction. We don't want any embarrassment felt on the part of those coming later concerning their staying for the dinner, which follows soon after the arrival of the second group. We are anticipating a banner crowd, and at dinner want nothing left over. I am acquainted with the appetizers set forth by this Club, after its regular meetings, and on the strength of that we are preparing accordingly.

SECOND VICE PRESIDENT WILDIN: We now come to the topic of the evening—"The Use of Statistics in Railway Management," by Mr. J. E. Slater, Special Assistant to the General Manager of the New York, New Haven and Hartford R. R. Co., who will now address us.

"THE USE OF STATISTICS IN RAILWAY MANAGEMENT"

By J. E. SLATER, Special Assistant to the General Manager of the N. Y., N. H. & H. R. R. Co.

Mr. Chairmen and Gentlemen: I think that the Railway Club of Pittsburgh is a very courageous organization, in that at one swoop it has brought a man from New England, where everything is supposed to be dead; and at that, a man from the New Haven road, which has been called all sorts of things during the past ten or twelve years, to talk statistics.

To the average railway man, statistics are usually put in the same category with post-mortem examinations, and many railway men take the attitude that the best thing about statistics is the end of them. However, we have found on the New Haven road that they are rather live things, if used correctly; and we have neither the time nor the means to put on things which are merely interesting. Therefore, that which has been done on our road in the way of statistics may be an example of what can or should be done in order to get the real benefit from them.

I have found that elsewhere, statistics by other names, are considered vital; that when we get down to the real gist of the situation, railroad men, no matter what their experience, have used statistics for many years, and consider them very necessary. The only difference is they don't call them by that name—they call them situation reports, or on-hand reports.

I don't suppose there is a railroad man here, who doesn't have on his desk every morning, a complete set of statistics as to how many cars he had on hand, how many in the yards, how many he has to move, how many he did move, what the condition of his power is, how much power he has, what conditions are as to on-time reports of passenger trains and fast freight trains. Those are all statistics, yet every railroad man looks upon them as a very significant part of the day's work, and would not consider doing anything without them.

Likewise, on the mechanical side—no mechanical man would think of going through a day's work without having a complete report as to the condition of his power, what the situation is in the various round-houses and at the shops on the previous day—and like information. In other words, those statistics are the basis of their instructions for the day. This sort of information railway men, both mechanical and transportation, find essential.

In the transportation department, the great slogan has been for years "move the cars, and the expenses will take care of themselves," or, as it is more badly put at times, "move the cars, and let expenses take care of themselves." Even among men more conservative in their statements, there is a tendency to say "move the cars, and expenses will automatically take care of themselves." In other words, with most of them, the fundamental necessity of moving cars has put everything else in the back-ground.

No one can deny that the fundamental job of the operating department is to move the cars. Yet it cannot be admitted that if the cars are moved, expenses will automatically take care of themselves. There is an old friend of mine sitting almost directly in front of me, who was in the army at the same time I was. We had to move the cars then, and we did move them, but we would not last five minutes today on a good railroad here, if we did what we then did to make the freight move. We moved the cars, because we had plenty of men, and might as well have kept them busy on that as anything else. But that would not work here, on an efficiently operated road.

It is the same in the mechanical department, where the outstanding idea has been "keep the power in shape, and let expenses take care of themselves." Here again, no one will deny that the job of the mechanical department is to keep the power in good condition, but the day has gone by when we can accept the idea that the expenses will take care of themselves. I have found many examples, particularly in the transportation department, where in truth it works diametrically the opposite, so far as expense is concerned. As an example, I remember a few years ago an analysis I made of car movements as compared with a previous period. There was a saving in per diem and equivalent expenses of twenty-two thousand dollars a week. Then I made an analysis of the yard expenses, and found we had spent twenty-three thousand dollars in yard expense to save twenty-two thousand dollars per diem.

Likewise, we have schools which favor light trains and fast movement, while others favor heavy trains and slow movement. Now, both of these schools will move cars efficiently and keep the yards clear, yet there will be a wide range as regards expense. I have in mind a road which for years claimed they could only operate light, fast trains on account of passenger service. That road would not think of putting on a trainload of more than two thousand tons on the main line, because of keeping out of the way of passenger trains. Today, they are moving the cars, and moving them rapidly by heavier loading, and if they increased that to five thousand tons, they could still move the cars.

Likewise, in the mechanical department, you can have plenty of men and may still keep power in good condition by cutting off ten or twenty per cent of them. That is, to say, the general economic condition is governed as much by the operating expense as the question of moving the cars or maintaining equipment.

In 1911, the operating ratio of the railroads of the United States was 69, while in 1920 it was 94; in 1911 the ratio of maintenance equipment expense to revenue was 15, as against 21 now. The transportation ratio has gone from 35 to 37. As between transportation and maintenance and equipment, there is an increase of six, eight or nine points in the ratio of expense to revenue.

The rate of return which the railroads paid in 1916 on investment was slightly over six per cent. Today, we feel quite lucky that it is over four per cent. That is one of the difficulties in financing, that only bonds can be issued for the purpose of making improvements. Now, everyone knows that ought not to be, nevertheless, with the exception of a few roads, there is no longer any inducement to the investor to buy stock; and the only way it can become so is to increase net earning. This, in turn, can most easily be accomplished by decreasing expense. Therefore, the question of expense, from the president down to the local supervisor, is a very important one.

If these expenses are so very important then we must have some way of measuring expense, as compared with traffic. We must be able to measure the effect of certain operating policies with reference to train loading, yard operation, etc.

You frequently hear it said: "I know what is going on in my department—I do not need to have experts tell me." Yet, strangely enough, I find that those men who are the most shrewd in observation are the men who call for and use in the most practical way, statistics of some kind; but that those who use them the least, are likely to be those men who cannot run their department well on the basis of their observation. No man, whatever may be his experience, can know everything that is going on along his division, unless he has some kind of reports to supplement that which he sees. That ought to be self-evident, yet it is not, at least not in the minds of many of our railroad men.

Now, if you are going to have statistics, there is just as much danger in too many as too few. Of course, on the transportation side, the old situation reports should be kept up. We should have moving situation reports, and I doubt not every road has some kind of situation reports. Certainly, we must know the situation as to cars on hand, those that have been on hand for over 24 hours, those subject to demurrage, cars moving out of the yards for the previous 24 hours, amount of power available for transportation and its general condition for service, etc.

On the mechanical side, it is absolutely necessary to have (and almost all roads do have) information as to the engines which are out of service, or which will be for 24 hours, together with the character of repairs, what failures there were the previous day, and the cause of those failures, who was responsible for those failures, etc. I do not want to create the impression that there has been no attention paid to costs, because for a long time back pay-roll reports of one kind or another, have been used; yet, fundamentally, how were expenses controlled? In many cases, they were reduced solely by arbitrary reductions of five, ten or fifteen per cent. All will agree that this sort of control was bad for all concerned, and probably created more harm than good in the end.

For a proper control of expenses what sort of report should be available?

In the first place, on the transportation side, we have three major fields—station, yard and train service. In the station service, we ought to have reports monthly, or even weekly, showing cost per ton for platform operation. A better unit is the tons per man per day, in order to have an operating unit which will not be effected by changes in wages or working conditions. And we ought to have a check on the clerical force, as to the cost per unit—not necessarily every month, but occasionally, so that one may know that the clerical force is not out of step with the actual work that is being done at the station.

On the transportation side, we ought to have a check (and most roads do) to make sure there are not too many cars being loaded between the same points, and thus having a lot of dead weight hauled around for a comparatively small amount of freight. That should be followed to determine whether the service provided between points is actually being used. That is, if shippers are demanding the service, and then using motor trucks and other means, there is a method of determining that fact.

Then, on the yard side, we ought to know what the cost is per car handled. To provide a uniform unit for all periods, regardless of wage schedules, etc , and we ought to have the cars handled per engine hour. We should also have some means of checking the cars through the yard, as to the delay per car. On account of the expense of an exact check it cannot be checked regularly. An approximate way is by comparing the number on hand with the number moved, and obtaining a percentage of the one to the other. Also, a report weekly, or twice a week, showing the actual cars in the yard, and the number of those that have been there over 24 hours very frequently indicate odd cars, perhaps, that have been staying around for a long time.

Every road has statistics of one kind or another to check its freight train service. Usually those are weekly or monthly reports by districts, and they should be made by classes of trains, showing the train load, train speed, and gross ton miles per train hour, etc. Terminal delay we have found to be a very important factor, and we check originating terminal delay by the number of minutes of delay per train.

The question of fuel consumed in freight train service is a subject in itself, there being so many different factors affecting it.

Many roads, including our own, have a check of its fuel performance by individual trains and some keep a record of the individual engineers. Personally, I believe that record is of doubtful value, because it is weak at the point where it ought to be strong, namely, in the estimate of fuel which is used in producing the gross ton mileage of the individual train. A chain being only as strong as the weakest link, that particular development is weak because the guess of the man at the coal pocket indicates what has been put on the engine. Nevertheless, a check on fuel can be developed by classes of engines and by districts.

All roads have statistics of passenger train performance, as regards running time and delays. However, it is equally important to know what the costs are. These should be expressed in the cost of train expenses per train mile and per car mile. In addition, the fuel consumption should be checked by the unit pounds consumed per locomotive and per car mile.

I suppose many of you read recently the railroad story called "Power," where an uneducated country boy from the wilds developed into the president of a large system. It was significant to me, that while statistics were belittled, that executive later in life was supposed to have made a record because of his attention to the pounds of coal consumed per ton mile, etc.

On the mechanical side, there is a difficult situation, as far as operating statistics are concerned. There, the units are not exact. While the units on the operating side are not exact in a technical sense, they are sufficiently so for practical purposes. When we come to maintenance costs, every job is different. I believe no one will contradict me, when I say that the statistics we have are not particularly valuable as a real measure of efficiency. We have five classes of locomotive repairs, and in each one of those you can find numerous examples of one repair double the cost of another in the same class of locomotive, at the same shop, in the same month, and under the same class of repair. Consequently, as an accurate measuring stick of output, they are almost useless.

At one time I tried to equate the classes in order to obtain some unit to measure the output and performance in one month, compared with another. A very interesting example of the result occurred recently. One of our shops made up a little statement showing how much money had been saved during the previous year. They equated classes 1, 2, 3 and 4 repairs to class 5 repairs, and arrived at a cost per equated unit. They then compared that unit cost month by month. It showed a constantly reduced cost, and a saving of two or three hundred thousand dollars on the pay-roll. I did not think very much of that idea of equating classes of repair, for I had tried it before, but in order to check it I took a somewhat different period to use as the basis for equating. In this statement, they had used one month in establishing the relationship of classes 1, 2, 3 and 4 to class 5 repairs. I used a period of six instead of one month, thinking that would, perhaps, be a fairer basis. I followed out the same line of procedure, and at the end, found there had been a loss of three hundred thousand dollars instead of a gain of two hundred thousand. You can come to your own conclusions. My conclusion was that neither was right, that neither meant a thing so far as the relative efficiency in that shop, in different periods, was concerned. If nothing else, it showed the fallacy of trying to equate classes of repair to a standard unit.

At the present time we have much heavy boiler work. Unless we renew the whole fire-box, we receive credit for a class 3 repair only; yet if we do nothing to the boiler but put in a set of flues, we receive the same credit as though we did everything except remove the fire-box. It makes no difference how much we strip the engine or what work is done on the accessories, because the class of repair is primarily dependent on the boiler work and time.

There are, however, ways and means of measuring output, cost and general efficiency in the mechanical department. There are two methods of arriving at that result. One of these is possible for any road, and the other possible only on roads where there is a system of piecework or bonus. Under the first method, the classes of repairs of locomotives is broken up and sub-divided. We have found it possible to sub-divide class 3 into six classes and class 5 into four classes. Those six classes under class 3 would first be based on whether or not the boiler work was heavy, medium or light, and second, on whether or not the repairs to machinery were heavy, medium or light. Class 5 can be divided into four classes, repairs to boiler and machinery, each being sub-divided into two classes. Such a method has the advantage of being practical on any road. It is, however, fundamentally subject to the same objection as to measuring of output by the total number of class 1, 2, 3, 4 or 5. It has an advantage in that it sub-divides the classes, and does not give the same weight to an engine having a set of flues removed, as one having most of the fire-box removed, as well as other heavy boiler work.

The second method is possible wherever there is a system of piecework or bonus, and where standard hours are available. The standard hour is, of course, the amount of time to perform each of the designated operations, based on time studies, and is used as a basis upon which to pay piecework or bonus. With standard hours, it is possible to measure what is done on an engine, by the standard hours which have been put into it. That should be distinguished from measuring classes of repairs by amounts of money actually spent, or the number of hours actually spent. Where that is done, it places a premium on inefficiency—the more hours, the heavier the class of repair. We had a very interesting example of that in two of our freight car shops. We used the number of man-hours for measuring the various classes of freight car repairs. There were two shops, doing exactly the same kind of work, and both efficiently managed, they were both making class 1 and 2 repairs, a class 1 repair representing 175 man-hours of work or more, while a class 2 require from 72 to 175 man-hours. We found that one shop was apparently falling behind in its output, while the other was running ahead. The first shop was receiving credit for more class 2 repairs and less class 1. Upon investigating, we found the reason to be that one shop had so increased its efficiency that it was requiring less than 175 hours for class 1. In other words, the shop doing the most work was receiving the least credit. If, however, we had used standard hours, to be applied to all conditions, the situation would have been correctly reflected in the statistics of output.

How are repair costs to be measured? About all we know now is, what it costs in total for each general repair to a locomotive. We have the cost in labor and material for each engine, and perhaps, such items as shop expense. If, however, we do not know precisely what was done on each particudar engine, we are not in a position to do other than make a guess as to whether that cost is too high or not. Furthermore, if conditions on other roads are anything like our own, I doubt whether the superintendent of motive power has the time to analyze each report and determine whether the job was done efficiently or not. Mr. Wildin is back of me, and I know I am taking a chance, but I believe he will agree with me that it is not a very accurate measuring stick of the work done on those jobs.

Today we know, as a rule, little more than the cost of repairs per locomotive and per mile. When we come to the parts of a locomotive, we have little tangible data. The knowledge of the relative cost of maintenance of various parts or different designs of the same part is based entirely on observation. Such knowledge is likely to be faulty. We have several types of valve motions on our road; each one has its ardent supporters. The cost of maintaining the valve motion is presumably a part of their knowledge. Obviously all of them cannot be right. The solution is in accurate information as to the cost of maintenance of part of the locomotive.

We should know the cost of maintence of the fire-box, the valve motion costs, the various other parts of the boiler, the running gear and accessories, as well as the tender. The same thing is true of freight and passenger cars. We have found it possible to obtain an enormous amount of information from the data compiled for the bonus, which can be classified in a brief way, showing what it costs to maintain the various parts of the locomotive, passenger and freight cars. Furthermore, I believe that is just the beginning of that sort of analysis. I believe the mechanical department must find a way, although it is very difficult, to obtain more accurate measuring sticks of their output and performance.

Now, this talk has covered an enormous field. The question is: How can the field be covered in a practical way?

In order to handle the matter quickly, there are many who seek one unit as an index of general operating efficiency. There are those who use the operating ratio. An excellent example of the fallacy of this unit as an index of efficiency is a situation on the New Haven. We receive an increase in mail pay of half a million dollars a year, and at about the same time receive an increase of several hundred thousand dollars in our operating revenue, through increases in commutation rates. These increases in revenue reduce the operating ratio to that extent. It takes a great stretch of imagination to see in what way this drop in operating ratio reflected an increase in the efficiency of operation. In other words, the operating ratio is affected as much by a change of revenue as by one in expenses. As an index of what the Operating Department has done, it is useless.

The train load is used as an index, on the assumption that if the train load increases, there is automatically an increase in efficiency in all branches of the Transportation Department. Obviously, this is absurd, since the trainload gives no indication of what is going on in the yards, at stations and other departments.

We frequently find the miles per car per day used as a general index of efficiency, but as has previously been indicated, car movement can be increased at the expense of station operation, yard operation or train operation. In other words, there is no such thing as a general unit of operating efficiency. We must view the problem from all sides.

There is, however, a way of correlating all of the statistics in order to determine what the result has been from operation as a whole. This can be done through the use of a budget. The budget is no new idea, having been used on many roads for the control of maintenance and mechanical expenses for many years. It has not been used in the same way for the control of transportation expenses. It is a fairly easy matter to work out a maintenance or mechanical budget. The former can be built up from the definite knowledge of the general condition of the roadbed, the necessary tie and rail renewals, painting program, etc. Likewise, in the Mechanical Department, it can be determined by a knowledge of the condition of power, the number of classified repairs necessary in the normal course of events and the amount of extraordinary heavy work such as new fireboxes, new boilers, and so on. Information as to these factors provide a background from which it is entirely possible to develop a budget. In the Transportation Department, the budget has not been found practicable because a fixed budget was not practicable. Maintenance expenditures can be controlled by a fixed budget because these expenditures are not affected to a material degree by the volume of traffic. Transportation expenses, however, are controlled by the volume of traffic, and if the fixed budget contemplates a volume which is lower than the actual volume of traffic offered, the expenditures would have to be made without regard to what was contemplated in the budget. Furthermore, on a fixed budget, if there has been an increase of 10 per cent over that contemplated, the superintendent will feel justified if his expenses have increased to any amount less than 10 per cent. Yet, we know there are many fixed expenses which should not vary with the traffic either up or down. The percentage of the fixed expense varies, but we find that it runs close to 40 per cent of the total transportation expenses.

The other items, however, will necessarily fluctuate in some degree with the traffic. We have found it practicable to operate the transportation expenses with a fluctuating budget. Under such a budget we have found that a 10 per cent increase in freight traffic will justify only a 3 per cent increase in transportation expenses. The budget is comparatively simple, involving the sub-division of transportation operations into its component elements, such as station service, yard service, freight train service and passenger train service. The budget for each division is based upon the best performance which has been obtained in previous periods, expressed in the unit cost of per ton of L.C.L. freight for station operation, per car in yard operation, per 1,000 gross ton miles in freight train service and per train mile in passenger train service. We assume a certain volume of business for each month of the succeeding year expressed in tons, cars, gross ton miles and passenger train miles. These applied against the unit costs previously mentioned produce the budget for each element of service for that division for each month of the succeeding year.

As the months come around, we have the actual traffic. This traffic expressed in tons at stations, cars in yards, etc., is compared with the amount contemplated in the budget. If the tons at stations have increased while the cars and gross ton miles have not, only the section of the budget covering station operation is increased. In other words, each factor in transportation operation is increased by the amount shown by the increase in the units handled; namely, tons, cars, gross ton miles and passenger train miles. In the meantime, fixed expense is unaffected by any increases or decreases in traffic. In such a manner, an adjusted budget is worked out, covering each month and each division's operations, the adjusted budget contemplating the proper volume of business and providing the operating officers with a definite mark to attain. In this way, all of the transportation statistics are correlated to provide a final figure which will indicate the transportation efficiency; namely, comparison of the budget performance and the actual performance month by month and division by division. It might appear that this involved numerous computations and a great mass of statistics. Yet, the controlling reports are found on two or three small sheets of paper. You can see, therefore, that it does not test the ingenuity of any officer to see the result.

I feel I have taken a lot of your time and have said more than I should but it is very difficult to include this subject in the course of a short talk. I thank you.

SECOND VICE PRESIDENT WILDIN: We have listened to a very interesting and instructive talk by Mr. Slater, and I am sure he will be glad to answer any questions you may propound at this time.

MR. C. O. DAMBACH: I think one of the most important things in connection with the use of statistics for railroad operation is for the official in charge of the department to which they apply to be thoroughly familiar with the manner in which they are compiled.

In regard to using miles per car per day as the measuring stick for efficiency I fully agree with Mr. Slater that unless the party in charge of the Car Service Department is responsible for transportation expenses as a whole there is danger in speeding up movement of equipment as it is liable to be done at an abnormal increased expense in yard, train and station service.

I am sorry Mr. Slater did not dwell more fully on yard costs, as this is an item of expense that I do not believe receives enough consideration in connection with railroad operation, and it is my opinion that the proper way to arrive at the yard performance is on a unit rather than a car basis, as there is entirely too much fluctuation in the cost of handling different movements in connection with industrial switching to permit of an accurate comparison by simply showing the cost per car.

With reference to road performance, there is no doubt but that considerable money can be saved by close co-operation between the Mechanical and Transportation Departments in order that crews may be called at the most suitable time they can be handled by the Transportation Department.

I agree with Mr. Slater that neither the cost per train mile or the operating ratio is the proper basis for arriving at operating efficiency, the former method being faulty for the reason that it is possible to make a record at the expense of light engine mileage, and the latter being subject to criticism for the reason that a change in rates would materially affect the operating ratio, which the operating officer could not control.

With reference to budgets for different departments, I am thoroughly in accord with Mr. Slater's views that this is the proper manner of keeping check on different departments with the exception of the Transportation, as it has been my experience that there are entirely too many items of expense beyond the control of the officer in charge to permit setting up an intelligent budget for this account. Of course, conditions on the New Haven might be different from those in this territory, and while general rules may be laid down for the operation of all properties, yet each railroad has its own problem, with which the operating officer should be most familiar and in position to apply the proper treatment to get best results.

MR. D. J. REDDING: On the Pittsburgh & Lake Erie we have been operating on the budget system for a long time. The heads of departments submit their statements at the beginning of each month as to just how much money will be required to operate during that month, and we try to maintain a fairly consistent operation so as to keep a comparatively constant number of men employed. In times of depression, however, when the earnings fall off, it becomes necessary to reduce the expenses in all of the departments in order that our monthly operating ratios will not get entirely out of bounds. To accomplish this, as Mr. Slater has said, it is necessary to have daily, weekly and monthly statistics showing each phase of the operating cost, and this is particularly necessary where a road is operating on a monthly budget system, as compared with the system under which Mr. Slater is working, which I understand is based on an annual allowance.

In the maintenance of locomotives, we endeavor to maintain a 50-50 condition, that is, based on the mileage assigned to all of the locomotives, if we can repair and put back into service a sufficient number of locomotives each month to liquidate an amount of mileage which has been run by those locomotives to equal the amount being used up in each month, we are keeping the equipment in a normal condition.

So far as operating costs are concerned, the figures are worked up by our accountants. We have an operating accountant and a shop accountant, who make up these figures month by month. I see Mr. Richardson, the Operating Accountant, and Mr. Murphy, the Shop Accountant, are here, and, perhaps, they can give us some information.

SECOND VICE PRESIDENT WILDIN: Mr. Richardson, how do you control Mr. Redding when he gets in his bill, and how does he manage to spend it all?

MR. H. R. RICHARDSON: When we think he is going to spend too much, somebody puts a hand on him and shuts him off.

We work out a budget for the Transportation Department every month, and as Mr. Redding stated, it is based largely on the previous month's operation and the outlook for the coming month. The car movement for the same month of the previous year, and the previous month is carefully analyzed, and in this the Traffic Department enters into it considerably, because they make a forecast of what business we are going to handle during the coming month, so that the transportation expenses are based largely on the traffic forecast. Generally, clerical forces are not disturbed except when there is a marked depression in business. In estimating the figures for the budget for the coming month, yard operation enters into it considerably and yard expenses can be minimized by forecasting what traffic is in sight.

We have been rather fortunate in forecasting what our operating expenses are going to be and can generally forecast it within five per cent of the actual expense—sometimes down as low as two per cent. In this respect we owe much to our Traffic Manager being able to tell us approximately how many loads are going to be handled and to that extent we necessarily depend on him. Transportation Department expenses necessarily fluctuate with the flow of traffic therefore if the Traffic Department errs in their estimate we also may err, because there seems to be no other way of controlling expenses, except in that manner.

MR. E. S. MURRAY: Most of our locomotive cost studies are based on cost per mile for fuel, engine house expenses, other supplies, water and repairs.

One of the difficulties in determining cost is in obtaining the correct information at the source. It is hard to train one's men so that they will report the correct information. At one time the P. & L. E. had twenty-eight different operations that they attempted to keep separate on classified repairs. Personally, I did not believe that it was possible to separate these operations correctly, as the work was done on an hourly basis and not on a piecework basis.

MR. REDDING: I also see Mr. O'Toole, Superintendent of Freight Transportation of the P. & L. E. is in the audience and, as he has a great deal to do with compiling and disseminating figures as to costs of operation in general, he should not be allowed to get by without contributing something to this meeting.

MR. J. L. O'TOOLE: Mr. Richardson being a transportation department man, I am surprised to hear him give so much credit to the Traffic Department.

It is true, however, as he states, that revenue figures for the ensuing month are based on estimates furnished by the Traffic Department, and that such information is usually accurate and reliable; but, like all forecasts, they are subject to unforeseen conditions which arise.

The management requires each and every officer to keep in close daily touch with traffic and service conditions. For example, in the Transportation Department, we are expected to know, when we go home each day, what may reasonably be required tomorrow. If we hear that coal mines on our own road or lateral connecitons are going to close down; or that there are disturbing conditions in the steel mills; in short, if we have information indicating a reduction in tonnage to be moved, we are required to see that all concerned are promptly and currently advised in order that action may be taken to reduce expenses accordingly.

I think Mr. Slater's remarks are very much to the point—that close supervision is required constantly, in order to make expenses keep pace with revenue.

SECOND VICE PRES. WILDIN: Is Mr. Morgan, Superintendent of the Pennsylvania Railroad, in the room? If so, we would like to hear from him.

(Mr. Morgan was present, but had nothing to add.)

SECOND VICE PRES. WILDIN: Mr. Berg, would you care to say anything on the subject?

MR. KARL BERG: It is very difficult to frame questions as regards this subject, for the reason that it is governed by so many different circumstances in the different shops.

Being a mechanical man, I have made some studies in connection with repairs on locomotives, and anything I have to say will be along those lines.

On the P. & L. E., where I am employed, we are using the mileage basis. That is, we are compiling our cost for running repairs with respect to the mileage run out during the month, and with respect to classified repairs against the mileage renewed per month.

I have never liked this basis, because I do not believe that it is entirely practical. Although I know the question has been raised at different times of changing this basis of calculation, it has never been done, probably for the reason it is hard to find any other logical basis.

I believe that costs compiled against the mileage, in such a manner, is not comparable for one road as against another, also, that such data, to some extent at least, puts a premium on inefficiency. I mean by that, the Transportation Department on one road might be more efficient than on another, as, for instance, consuming less mileage in moving the same amount of tonnage and cars. Therefore, the cost will run up per mile accordingly, which is a condition that the man held responsible for costs, cannot control.

There are roads which have a number of small branches, where small locomotives are used that can be repaired cheaply, and still run out lots of mileage; and in that way tend to reduce the cost per mile for the road. There are a number of other conditions, other than efficiency in shops and roundhouses, tending to raise or lower cost when based on mileage.

I think some more logical base could be arranged on which to place the computation, and I would like to see some means used representing a real commercial value. I am speaking of the locomotive shop, that being the only part I am directly interested in. If mileage is used, I believe it should be used in connection with tonnage hauled, as it would give a more logical basis on which to base figures for costs. I believe it would also serve as a guide to the transportation department and others, in knowing the cost of maintenance for a particular class of locomotive, in moving a certain amount of tonnage.

I don't believe that classified repairs can be entirely and effectively separated from running repairs. In other words, there may be a difference in the amount of work currently applied to locomotives to make them run through a longer period. I think the total maintenance cost must be considered finally.

I am not in favor of having a number of separate distributions in the shop that have to be taken off daily, inasmuch as it can be extended to a point where it becomes a burden on the shop supervision, in addition to this fact, it may become impossible to subdivide it, if you have too many subdivisions. At present, in our shops, we find we have some·thing like sixteen to twenty different distributions that we have to account for daily, considering, of course, that we do repairs of all kinds, the classified consisting of about fifty per cent of the output of the shops.

There is another important item in connection with costs, that must be considered, that is the cost of material, the cost per locomotive in labor may be computed by man hours, which is not a very logical practice; and may be computed against constructed or standard hours, as the speaker so well explained. The cost of material should be controlled, I think, by the official who is responsible for the total cost.

I do not see how it is of any particular value to get the exact cost of each locomotive repaired. I believe if the average cost is obtained per each locomotive of a certain class, it would answer the purpose, or the total maintenance cost spent on that particular class of locomotive.

The question of overhead percentage in railroad shops is quite a live issue. At present we compute our percentage of overhead, indirect labor, supervision, etc., against the cost of the pay-roll for productive labor. This again tends to place a premium on inefficiency. In other words, the larger the cost of productive labor, the smaller the per cent of overhead. I think there is a chance for improvement, but as regards suggestions along that line, I have none to offer.

SECOND VICE PRES. WILDIN: If anybody wishes to speak further on the subject, they now have the opportunity—we will be glad to hear from you.

MR. A. E. ANDERSON: The gist of the speaker's experience is based upon the fact that he was connected with a poor road, having had to work out problems with a poor road.

Mr. Dambach's statements, that railroad operations depend a great deal on temperature, may be compared with Mr. Richardson's forecasting, and in that way we will have the satisfaction of knowing we at least have a forecast that will compare with that of the Weather Bureau.

When you consider all the problems that the railroad operator has to contend with, as illustrated by the various speakers, it is remarkable what has been done; and if the general public had the information that goes with these discussions that we have in the railroad meetings, they would realize better the problems that the operators are up against.

A railroad must operate, no matter what the status of business conditions is. Unlike a manufacturing plant, it cannot shut down, as we have noted some sixteen mines have done within the last month, in addition to the announcement by six more that they are going to do so on account of the wage situation with the mine operators.

A question that occurs to me is—take this coal situation for instance—How is the maintenance and upkeep of empty coal cars to be accounted for, in railroad accounting. Another is, the comparison between the allotment of passenger expense and freight expense. It has been emphasized that in figuring the rates for aeroplane service, they are going to put both passenger and freight carriage on a weight basis; but when you take our heavy passenger coaches, sometimes hauling very few passengers, there must be some allowance made as to the loss sustained by that passenger service, as compared with what it ought to be.

MR. SLATER: I am afraid there has been a wrong impression given; namely, that I am not in favor of a budget in transportation. On the contrary, I believe that until we shall have a budget all the way through, for all departments, the full object of it will not be attained.

We formerly had a budget much like that described on the P. & L. E. Railway, that is made up from month to month. I think an estimate within four or five per cent pretty good, but with a budget made on a fluctuating basis, it doesn't matter whether the original estimate basis is one or fifteen per cent too high, the final adjusted budget will be correct. We are, therefore, not restricted by any estimate of traffic made by the traffic department or superintendent of car service—the budget automatically takes care of that situation.

With regard to operation and maintenance, I believe a budget can be worked out so as to do away with trivial explanation of what happened in one month, as compared with another month. We do not write one letter a year, asking for an explanation. On the budget basis, our superintendents and master mechanics are so interested in what is being done, that they are right after division accountants, and they know the situation long before we do. Likewise, when they come in to the monthly meeting, they can explain any differences in expense, even a few hundred dollars.

The point was raised about a unit of shop expense. I heartily agree that locomotive miles are not a very good measuring stick of shop efficiency. A locomotive mile doesn't represent the work the shop does, but what the transportation department does. We ought to check shop costs with shop performance, and for that purpose should have some accurate measuring stick.

Some rather difficult questions have been propounded—one was a method by which we can control fixed expense. The manner in which we have controlled it is something like this: For about three years we were cutting expenses, especially the bad period of 1921, when the net income was down. With that low point, we analyzed those fixed expenses for a period of a year, found the low point for the year, and said "this is going to be our budget for the next twelve months." Ovbiously, if you take the best month of the twelve, and apply it to twelve months, you are going to obtain a substantial reduction.

As to the question of costs, applied to rates on passenger and freight service, a commisioner of a rather unique commision, made the remark with reference to a possible increase in rates on certain classes of transportation, "I am with you; I think you ought to have the increase, but fundamentally, what is going to control is whether or not the traffic will stand it." In other words, going back to the very much ridiculed and berated theory of what the traffic will bear." On very expensive classes of traffic—it cannot be based in a final analysis, on what it costs, because the traffic would not move.

Regarding freight car repairs, we have an interesting situation. We have about twenty to twenty-five per cent in bad order, and it is a problem as to what to do with them. So far, we haven't the answer. Every time I check up, I think I arrive at the same answer. There is the matter of temporary greater supply than demand, and until the demand is such that those can be worked into service, it would be foolish to have them enter into the accounts in any other way.

I do not know whether I have answered all questions satisfactorily, but I have answered such as I kept in mind. I thank you.

MR. SAMUEL LYNN: I agree with Mr. Slater that the man in charge of Freight Car Maintenance has to have certain information on his desk before he can classify this work.

Our company works on the budget system and when we get into a depression of business, as Mr. Slater has aptly put it, and certain classes or types of cars are not in demand, instead of maintaining them, they are placed on the side tracks. However, we must remember that rolling stock, paritcularly an all-steel car, when standing idle, deteriorates just as fast, or faster, as when it is in service, and if the repairs are not made, it is simply a question of deferred maintenance and if the repairs are deferred until the car is actually needed, there is a possibility that you will have so many of them and they will have deteriorated to such an extent that it may not be advisable to spend the money necessary to repair them.

The equipment man who keeps in touch with his job realizes that whether an all-steel car is in service or not, a certain amount of money has to be spent on it, or it has got to be set on a side track until such time as it can be repaired.

The officer in charge of Rolling Stock Maintenance should know what certain classes of repairs on the different types of equipment should cost and a check should be kept on the different shops to see that the shop costs keep within certain figures. It is my opinion that on a budget system, the man in charge must study his conditions, as the conditions will fluctuate throughout the year and certain types of equipment may be required for one period, whereas a different type of equipment may be required during another period, and unless the equipment is maintained, there is a possibility that the particular type of equipment most needed will not be ready for service when conditions require it.

MR. REDDING: I don't want to be misunderstood in regard to shop and maintenance accounting. I would be more than pleased if we could operate on an annual budget which would permit of increasing forces and making an extra drive on maintenance at times when the engines were not so badly needed in service, and then slowing down on such work when every engine was needed for service. We, however, in common with most of the railroads, operate on the monthly budget system and must trim our expenses in accordance with monthly income.

I feel that Mr. Slater has given us a great deal of valuable information in his talk tonight, and I offer a motion that we extend to him a vote of thanks for a very interesting paper. (Motion seconded.)

SECOND VICE PRES. WILDIN: You have heard the motion made and seconded that we extend to Mr. Slater a vote of thanks for his splendid paper—all in favor of that, will signify by rising. (Unanimous.)

Upon motion, adjourned.

J. D. CONWAY,
Secretary.

In Memoriam

FRANK M. McNULTY,
Died April 6th, 1925

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Before me, a Notary Public, in and for the State and County aforesaid, personally appeared J. D. Conway, Secretary, who, having been duly sworn according to law, deposes and says that he is Editor and Publisher of the Official Proceedings—Railway Club of Pittsburgh.

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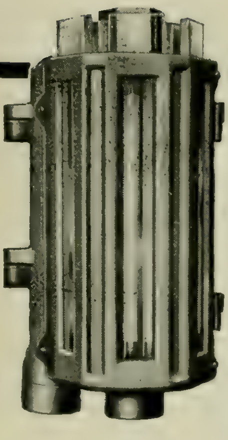

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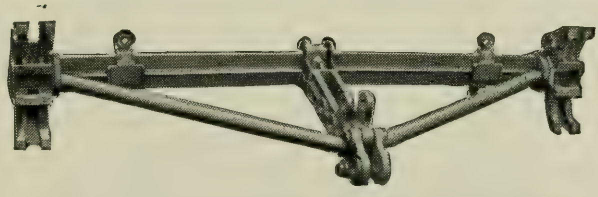

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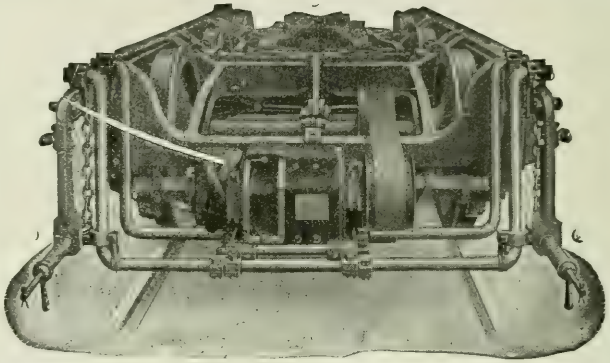

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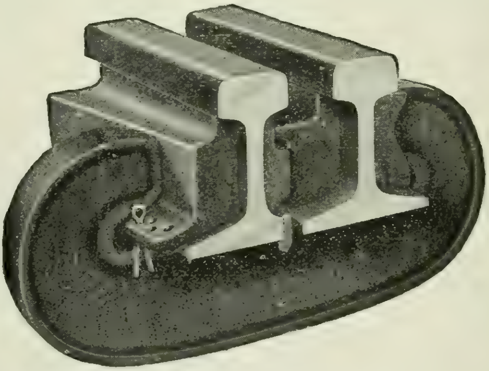

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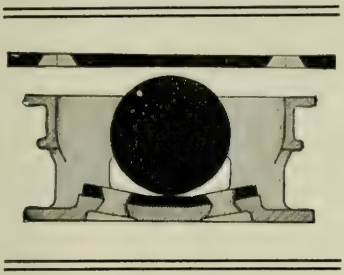

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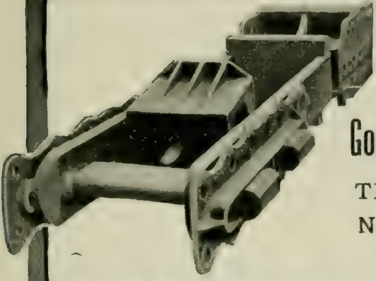

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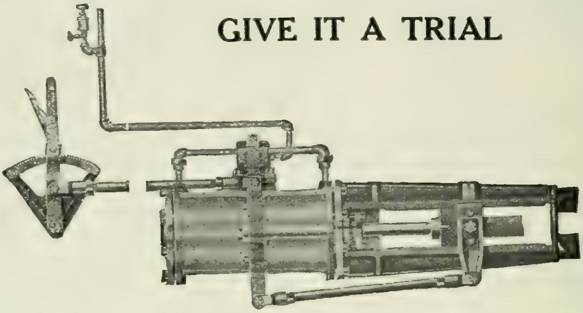

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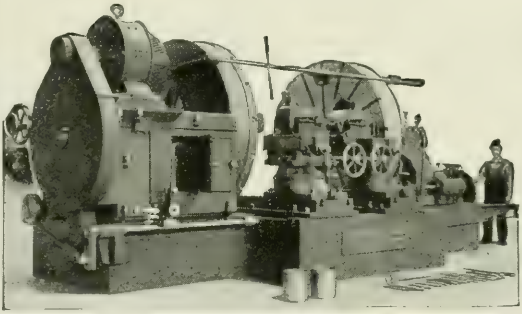

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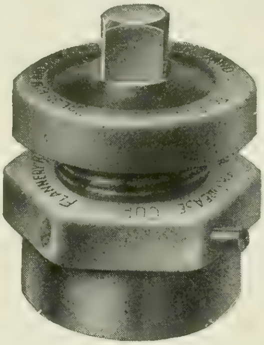

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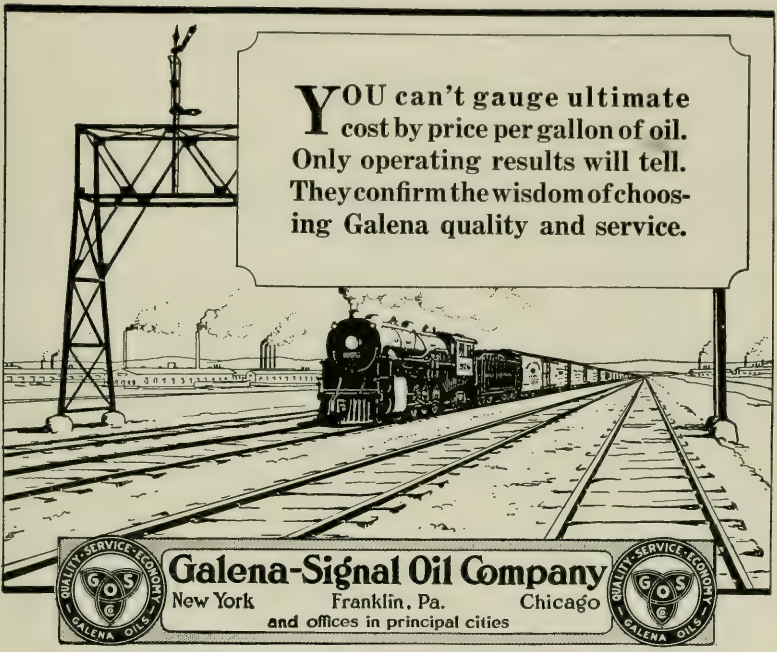

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INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	viii
American Brake Shoe & Foundry Co.	iii
American Locomotive Co.	vi
American Steel Foundries	xvii
Baldwin Locomotive Works	viii
Ball Chemical Co.	v
The Bradford Corporation	ix
Brady Brass Co.	Front Cover
Chicago Railway Equip. Co.	xiii
Davis Brake Beam Co.	i
Dearborn Chemical Co.	iv
Flannery Bolt Co.	x
Fort Pitt Malleable Iron Co.	xi
Galena-Signal Oil Co.	xi
The Gould Coupler Co.	ii
Graham Bolt & Nut Co.	Front Cover
Grip Nut Company	xix
Hagan, George J. Co.	Front Cover
Hunt-Spiller Mfg. Corporation	x
Johns-Manville, Inc.	xvi
Johnson Bronze Co.	i
Locomotive Stoker Co.	xv
McConway & Torley Co.	xv
National Malleable and Steel Castings Co.	iv
Niles-Bement-Pond Co.	vi
O'Brien, Martin J., Co., Incorporated	Front Cover
Paxton-Mitchell Co.	iv
Pgh. Testing Laboratory	Front Cover
Pressed Steel Car Co.	xix
The Q. & Co.	ii
Railway Equip't. and Publication Co.	iii
Railway Steel Spring Co.	xvi
Safety Car Heat. & Lighting Co.	xvi
Schaefer Equipment Co.	v
Sipe, James B., & Co.	iv
Southern Wheel Co.	iii
Standard Safety Nut Corp.	Front Cover
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	iii
The Superheater Co.	Front Cover
Suydam, M. B., Co.	Back Cover
The Symington Co.	v
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xviii
U. S. Metallic Packing Co.	xvi
Vapor Car Heating Co., Inc.	xviii
Westinghouse Air Brake Co.	vii
Westinghouse Elec. & Mfg. Co.	vii

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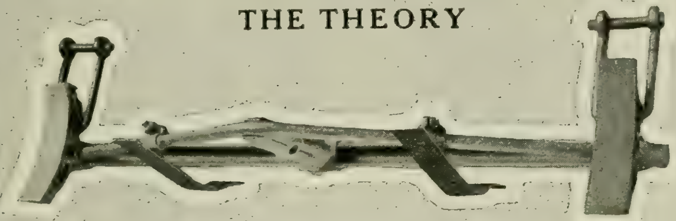

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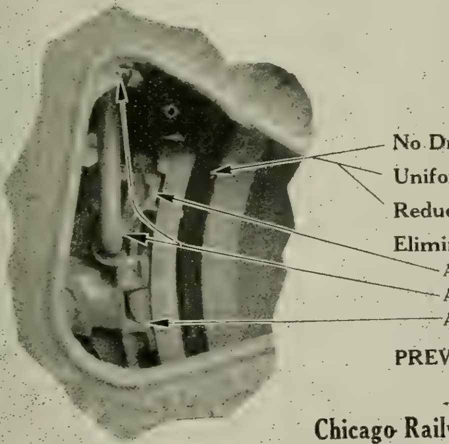

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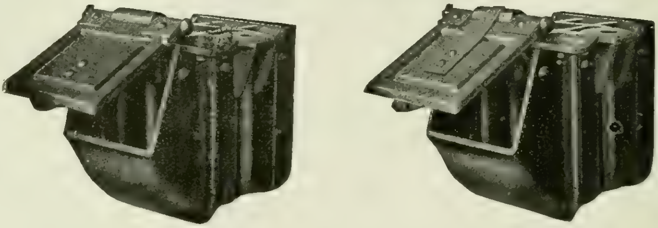

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OF

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Organized October 18, 1901

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No. 7

Pittsburgh, Pa., May 28, 1925.

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*J. H. McCONNELL	October, 1901, to October, 1903
L. H. TURNER	November, 1903, to October, 1905
F. H. STARK	November, 1905, to October, 1907
*H. W. WATTS	November, 1907, to April, 1908
D. J. REDDING	November, 1908, to October, 1910
F. R. McFEATTERS	November, 1910, to October, 1912
A. G. MITCHELL	November, 1912, to October, 1914
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J. G. CODE	November, 1916, to October, 1917
D. M. HOWE	November, 1917, to October, 1918
J. A. SPIELMANN	November, 1918, to October, 1919
H. H. MAXFIELD	November, 1919, to October, 1920
FRANK J. LANAHAN	November, 1920, to October, 1921
SAMUEL LYNN	November, 1921, to October, 1922
D. F. CRAWFORD	November, 1922, to October, 1923
GEORGE D. OGDEN	November, 1923, to October, 1924

*—Deceased.

Meetings held fourth Thursday of each month except June, July and August.

PROCEEDINGS OF MEETING

May 28th, 1925.

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., at 8 o'clock, P. M., President A. Stucki in the chair.

The following gentlemen registered:

MEMBERS

Adams, Frank T.
Allison, John
Altsman, W. H.
Ambrose, W. F.
Anderson, A. E.
Ashton, William A.
Balzer, C. E.
Blume, W. A.
Borg, John E.
Boden, T. C.
Brandt, W. L.
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Burk, George C.
Carlsson, John
Cartwright, William E.
Chase, C. N.
Conway, J. D.
Cooper, J. P.
Cotter, George L.
Croke, Thomas F.
Cruikshank, J. C.
Davis, Charles S.
Dunbar, H. F.
Durkin, James E.
Edwards, C. H.
Endsley, Louis E.
Fike, James W.
Fowler, W. E., Jr.
Fritz, A. A.
Goda, P. H.
Greene, W. F.
Hanscom, J. R.
Harris, John P.
Hoover, R. C.
Hopkins, H. V.
Howe, D. M.
Hulick, E. G.
Hyde, W. B.
Johnson, William
Joyce, Thomas J.
Jungbluth, Adolph
Karns, C. A.
Kegel, A. E.
Kelly, L. J.
Kennelly, D. F.
King, J. W., Jr.
Kroske, J. F.
Kunkel, H. C.
Laughner, C. L.
Laurent, G. F.
Lee, L. A.
Leonard, P. J.
Lobez, P. L.
Lohr, Allen W.
Ludwig, C. F.
Lynn, Samuel
Maliphant, C. W.
Mann, N. T.
Miller, John
Mitchell, W. J.
Mitchell, W. S.
Muir, R. Y.
Myers, W. H.
McGeorge, D. W.
McGrann, E. R.
McLaughlin, H. B.
Noble, J. A.
Norris, J. L.
Obermeier, L. J.
O'Neill, Thomas J.
Orchard, Charles
Painter, Joseph
Parke, F. H.
Penn, William
Purnell, C. S.
Redding , P. E.
Reeve, George
Renshaw, W. B.

Ryan, William F.
Sattley, E. C.
Shannon, W. R.
Sharp, James
Shellenbarger, H. M.
Smith, R. H.
Smith, R. W.
Spielmann, J. A.
Stewart, L. S.
Stucki, A.
Timme, W. F.
Uhler, J. L.
Vanatta, F.
Van Blarcom, W. C.
Venning, J. C.
Walter, W. A.
Walther, Charles W.
Walther, G. C.
Warrensford, Fred S.
Weissert, W. J.
Wheatley, William
Wildin, G. W.
Winslow, S. H.
Wright, James H.
Wynn, E. M.
Wynn, M. E.

VISITORS

Allman, C. E.
Boak, R. C.
Bouton, C. M.
Carroll, G. R.
Doyle, E. J.
Hill, G. H.
Hunter, Joseph A.
Jungbluth, Herbert A.
Kreutzer, H. A.
Lewis, L. H.
Lewis, S. B.
Moffat, W. J.
Morrison, R. C.
Neil, C. O.
Nicholls, P.
Rice, William E.
Shellaby, E. H.
Starr, A. D.
Zeher, William G.
Van Berneurtz, M. W.

The call of the Roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with, as they are to appear in printed form.

The Secretary read the following list of applications for membership:

Buers, Q. S., Asst. E. H. Foreman, Pennsylvania Railroad System, 1683 Morningside Avenue, Pittsburgh, Pa. Recommended by H. Laughlin.

Gramley, D. M., Gang Foreman, Pennsylvania Railroad System, 416 Sixth Street, Monongahela City, Pa. Recommended by Arthur Spotts.

Nelson, Alvin S., Chief Smoke Inspector, B. & O. R. R. Co., 205 North Elizabeth Street, Pittsburgh, Pa. Recommended by J. A. Spielmann.

Sharp, James, Master Mechanic, McKeesport Connecting Railroad Company, Box 298, Homestead, Pa. Recommended by E. R. McGrann.

Smith, M. A., General Manager, Edgewater Steel Co., Box 249, Pittsburgh, Pa. Recommended by D. W. McGeorge.

Thomas, F. A., District Representative, Hauck Manufacturing Company, 6115 Alder Street, Pittsburgh, Pa. Recommended by Harry Laughlin.

PRESIDENT: These applications will be referred to the Executive Committee in due course, and upon approval by them, the gentlemen will become members without further action than the payment of the current year's dues.

SECRETARY: You will all be delighted that our President is back to preside over our meeting, after an absence of four months on a tour around the world. I believe it would be proper on this occasion to felicitate him upon his safe return.

MR. A. E. ANDERSON: As our Secretary has just returned from an absence nearly as long I would like to include the Secretary in that action.

The members responded by rising and applause.

PRESIDENT: Gentlemen, this is indeed a surprise to me. I consider the pleasure of being here tonight to be all mine. I assure you it is a real pleasure. It is true that since I saw you here last I have travelled around the globe. It was an interesting trip. We visited all the continents except Australia. I told you that when I was opposite Pittsburgh I would look up and think of you. This I did, when we were in Java.

A trip of that sort is interesting and in a way broadening, to see the different countries and the different nationalities and the different ways they do things. We do it one way here. Other nations have other ways. And they all seem to get there some how, sooner or later. Take the matter of clothing as an illustration. Sometimes very few clothes are worn. In India we saw people with nothing but a part of a sheet. During the day they wrap it around themselves, leaving three-quarters of their body exposed. At night they use that same sheet as a mattress and a cover and wrap themselves up in it and sleep on the sidewalk or in the railway station or whever they happen to be. It was in a way pathetic, but in another it was instructive to see how little it really requires to exist. Take the other extreme, royal robes stitched with gold and studded with diamonds and what not, you have the feeling that the difference is too great.

You see those extremes in every detail of the way of living, in the way of housing, in the way of transportation, even in the way of burying the dead. In some parts of India all that is necessary to dispose of a body is a little pile of wood. The river Ganges takes care of the ashes and that is the end of it. Still simpler is the method of the Parasees, also in India. After their funeral services in the temple of silence, the friends and relatives retire and the vultures alight and in less than two hours there is nothing left but clean bones.

The other extreme you see, when you visit the tombs in India and especially in Egypt. Tombs that cost millions of money and millions of days' work of men. From boyhood I have dreamed of those great pyramids and sphinxes and cathedrals and columns, and I looked forward with great anticipation to see these on this trip. But I had no conception of the immensity of these silent monuments of prehistoric splendor. We went up the Nile and rode over the desert for quite a while before we came to King Tut's tomb. It was closed, but we entered another one near by. About fifty or sixty feet below the ground there was a room possibly forty feet square, marvelous columns and black and white decorations in tile work, designed in straight line configuration, and all as fresh as though it had been done a week ago. In that room down there we saw the mummy of another king, flesh and hair could be seen, and at the side of the room his children were prepared the same way. All had been resting there for four or five thousand years.

Similar striking contrasts could be told you in regard to transportation, that might interest you. But I will simply say that while the trip was interesting and broadening it above all made us love our own dear country that much more.

SECRETARY: We regret to announce the death of one of our members, a gentleman who has been connected with our Club for many years, Mr. Harry S. Hunter, President of the Hunter Saw & Machine Company, who died May 7, 1925, at Cambridge Springs, Pa.

PRESIDENT: An appropriate memorial will appear in the next issue of the Proceedings.

If there is no further business we will proceed to the paper of the evening. It gives me great pleasure to present Mr. P. Nicholls, Fuel Engineer, United States Bureau of Mines, Pittsburgh, Pa., who will speak to us on The Story of Power.

"THE STORY OF POWER"

By **MR. P. NICHOLLS, Fuel Engineer, United States Bureau of Mines.**

We are showing you tonight a very recently released film entitled "The Story of Power," which was produced by the Bureau of Mines in collaboration with the Stone & Webster Company. The term power is used in its general popular engineering sense of production of energy in available form, more particularly by the harnessing of natural forces than by the exertions of man himself. The film traces the growth of the substitution of such power from its earliest beginnings up to the gigantic super-power stations of today. In particular it very clearly shows the principles involved in the actions of turbines and electrical machines.

Progress in knowledge and in achievement has been so rapid during this generation that figures no longer impress or stir our imagination. To state that there is now available for every man, woman and child in the United States the equivalent of 60-man power should impress us, however, in showing how little of the energy we use is supplied through our own physical exertions Again, assuming that a man works one-third of his time, and that the minimum yearly cost for him to live is $500.00 per year, the cost of a true man-power year is $1,500, whereas some electrical energy is distributed at a cost of only $4.00 per man-power year.

We are accustomed, and rightly so, to chide and lecture each other as individuals and as a nation on our wastefulness in all things, and in particular in our use of our natural resources. It might be argued that we are wasteful in needing the rapidly increasing amount of power that we use, but at least we can claim that we are not neglecting to improve its economical generation. Whereas 20 years ago we felt proud of converting 75 per cent of the available chemical energy of fuel into heat in the steam, now they have succeeded in increasing it to 90 per cent. Whereas then we could only utilize 76 per cent of the available energy of a water fall,now hydraulic turbines exist which have 93 per cent efficiency.

Similar improvements have been made in converting the heat in the steam into electrical or mechanical energy, but in these conversions we must use much lower figures and speak of an improvement from 15 to 25 per cent, which shows that large possibilities still exist.

We must not pat each other on the back too vigorously, however, but be willing to give credit where it is due. We must note that these attainments in improved efficiency are due largely to the big organizations who have been willing and far-sighted enough to devote money to scientific investigations, or at least have recognized the possibilities that such work has pointed out. We cannot claim that as small users or individuals we have assisted much in the preservation of our natural resources.

The improvement in efficiency of the average small power plant has not been large, though there is every indication that it will be more rapid in the future. "A primrose by the river's brim, a primrose only was to him, and nothing more" can often be applied to the viewpoint of an owner towards his power plant, and as long as it does not stop running or increase its demand for coal, he does not bother about the teachings of science concerning possible improvements.

Individually we have improved little, if any, in the manipulation of our own small house-heating plants. It it true that we can buy apparatus which will probably yield some improvement in efficiency over that which was available 20 years ago, but we demand more heat than they did then and also are no more efficient firemen. We can again take comfort that an awakening is evident, and the increasing cost of the higher class of fuels will bring about better heat-proof houses, and a quicker dissemination of a knowledge of the possible savings that can be made.

You, through your clubs, and in particular through your Fuel Associations, have been doing excellent work in not only making more power available, but also in obtaining its more efficient generation and utilization. Due to the large number of comparatively small—and always moving—power plants that you are interested in, you have to depend on continued reiteration, until advice or instructions regarding what should or should not be done become a matter of habit.

The complete activities of the Bureau of Mines cover a very large field, and the section of it concerned with the utilization of fuel is only a small part of the whole. The objective of that section is to study the better utilization of all fuels and the possible utilization of inferior ones; also, when necessary, to make studies of appliances used in connection with fuels. The studies are not restricted to the use of fuels in power plants, but include all other applications, such as kilns, furnaces, and heating plants, both large and domestic. It is naturally the province of a governmental department to help or advance those who need it, rather than to do work the result of which will obviously yield commercial profit. Well organized industries are able to do their own investigation and develop new or improved methods or apparatus that will repay the preliminary expenditure. The Bureau was able to render help in the development of the use of powdered fuel, but when the financial possibilities became more generally recognized, its help was no longer required.

Similarly, extensive studies were made on the action in the combustion space, and on methods of firing, in the belief that the importance of the size of combustion space and the gain in efficiency by the proper control of the air supply were not recognized by the many manufacturers of boilers. The changes in practice that have occurred are largely to be credited to this work.

The Bureau has always been willing to join with an industry to study its fuel burning problem, and indeed owes such success as it has had largely to the co-operation it has received. It has worked with ceramic and metallurgical industries, and its help is particularly needed where the plants are small and scattered.

It is also whole-heartedly with the individual householder in being desirous to help him reduce his fuel bill. Such work is necessarily the most difficult to influence due not only to the large number of users, but also to the large number of manufacturers and distributors of the appliances. In such work the fullest co-operation of the manufacturers associations and the technical societies is very necessary.

The smoke nuisance we always have with us. Its prevention, or the substitution of smokeless fuels are continually requiring study. There again the solutions for the large users are more easily obtained, but to prevent it in domestic furnaces is more difficult. For this reason tests on coke, and the possibilities of commercially producing a low temperature coke are live subjects.

In all our work we are willing to be looked upon as the crow-bar which you use on the flywheel on an engine to start it going. As soon as it has got over its dead center and the force of its own steam will spin it along, then you can lay us aside.

The film will leave you at modern super-power station, but what of the future? Whether single boilers which are as large as a six-room house, generating units of 80,000, and stations of 500,000 kilowatt capacity will still further increase in size or merely multiply in number is not of great importance. The questions of the duration of our fuel supply is always an interesting subject to speculate on. Figures have been frequently quoted lately and estimates point out that our petroleum will last 30 years, and the supply of the whole world 100 years. High grade easily mined coal perhaps 100 years, and lower grades several thousands. However, if all other nations should tend to increase their rate of consumption to compare with ours, then prices will be sure to mount more quickly.

These figures include the inferior fuels, such as lignites and brown coals, and this is certain that, as time goes on, their utilization will become more and more necessary. Whether that will be accomplished by burning them directly or by making their energy more available by an intermediary treatment is as yet uncertain. Before the necessity becomes urgent our descendants will probably have advanced their knowledge and ability far beyond that which we possess.

The first urgent need which will be felt will be due to the lack of petroleum, and more particularly of the lighter oils, which includes gasoline. Indications of the type of method by which they may overcome their difficulties is shown in the recent developments of processes to convert coal into oil. Two lines of attack have been originated in Germany. One is to almost completely liquify the coal by heating it under a compressed atmosphere of hydrogen, and the other to make light oils from producer gas, by a synthetic method, that is, one which rearranges the carbon, hydrogen, and oxygen in the producer gas into the more complicated combinations of the oils. Such methods of treatment are sure to become of increasing importance.

It does not follow that future generations will have to depend on fuels for their power. Scientists who are investigating the atoms and molecules show the possibility of immense stores of energy being obtained by transformation of one form to another. Any practical development is apparently far in the future, but as engineers we have other sources than fuels which we hardly have touched. The surplus power in waterfalls is still large; that in the tides has only been played with; that in the wind is said to exceed our coal consumption rate 5000 times, and that in the heat of the sun 70,000 times.

Therefore, while you and we do our little bit to improve efficiency, and economically use our natural resources, yet we need not skimp ourselves for fear of a dearth in the future.

I would like to close this sketchy introduction to the clearer story which you will see in picture form, by reading a piece of poetry.

THE SONG OF STEAM

Harness me down with your iron bands,
Be sure of your curb and rein,
For I scorn the strength of your puny hands
As a tempest scorns a chain.
How I laughed as I lay concealed from sight
For many a countless hour,
At the childish boasts of human might,
and the pride of human power.

When I saw an army upon the land,
A navy upon the seas,
Creeping along, a snail-like band,
Or waiting the wayward breeze;
When I marked the peasant faintly reel
With the toil that he daily bore,
As he feebly turned the tardy wheel,
Or tugged at the weary oar.

When I measured the panting courser's speed,
The flight of the carrier dove,
As they bore the law a king decreed,
Or the lines of impatient love,
I could but think how the world would feel,
As these were outstripped afar,
When I should be bound to the rushing keel,
Or chained to the flying car.

Ha! ha! ha! they found me at last,
They invited me forth at length,
And I rushed to my throne with a thunder blast,
And laughed in my iron strength!
O, then ye saw a wondrous change

On the earth and ocean wide,
Where now my fiery armies range,
Nor wait for wind or tide.

Hurrah! hurrah! the waters o'er,
The mountains steep decline;
Time—space—have yielded to my power
The world, the world is mine!
The rivers the sun hath earliest blest,
Or those where his beams decline,
The giant streams of the queenly West,
Or the Orient floods divine.

The ocean pales wherever I sweep
To hear my strength rejoice,
And monsters of the briny deep
Cower trembling at my voice.
I carry the wealth of the lord of earth,
The thoughts of his god like mind;
The wind lags after my going forth,
The lightning is left behind.
In the darksome depths of the fathomless mine
My tireless arm doth play,
Where the rocks ne'er saw the sun's decline
Or the dawn of the glorious day;
I bring earth's glittering jewels up
From the hidden caves below,
And I make the fountain's granite cup
With a crystal gush o'erflow.

I blow the bellows, I forge the steel,
In all the shops of trade;
I hammer the ore and turn the wheel
Where my arms of strength are made;
I manage the furnace, the mill, the mint,
I carry, I spin, I weave,
And all my doings I put into print
On every Saturday eve.

I've no muscles to weary, no brains to decay,
No bones to be laid on the shelf,
And soon I intend you may go and play,

While I manage the world myself.
But harness me down with your iron bands,
Be sure of your curb and rein,
For I scorn the strength of your puny hands
As the tempest scorns the chain.
[—George W. Cutter.

From a book of selected poems published in 1893.]

At this point a three-reel film, "The Story of Power," also one-reel film illustration of home fuel consumption, was shown.

PRESIDENT: This has been a most interesting paper, on a subject that will never be completed. I hope you will bring out additional information by questions or discussion.

MR. A. E. ANDERSON: I wish first to corroborate your introductory remarks about your trip, confirming the fact that you put your foot against the other side of the world, because we had at least three different earthquakes in this section of the country and in the east while you were gone. So we felt your footfalls from China and Java.

This lecture and the illustrations have been a complete course in power engineering. There are two or three questions I would like to ask. One is how far progress has been made in the use of powdered coal as making for efficiency in power plant furnaces.

Another refers to a story of Hendrick VanLoon in which he writes a story on the teaching profession as to a friend of his who learned the language of animals, and based upon this saying that "you can lead a horse to water but you can not make him drink," they were very indignant and decided to have a Book of Pony Proverbs of their own, and the first one they adopted unanimously was that "you can lead a man to a job but you can't make him think." From what Mr. Nicholls stated in his opening remarks of the experience he has had with people with small power plants to get them to understand the improved efficiency which the Bureau of Mines had worked out, I judge he has had some experiences along that line which might be interesting to us.

Then looking toward the future we would like him to give us some idea as to how near the 100% efficiency they are going to arrive at and what proportion between water power available and coal power. As I understand from my reading there is not more than 25% of the power available from the use of water power and that 75% will depend on the use of coal in steam plants. I would like to hear his confirmation or correction of that statement.

I know I have enjoyed this talk very much. It has been most comprehensive and instructive and as it is the first time in Pittsburgh that these educational films have been shown, I think it sets a precedent for this Railway Club to have a picture of this kind presented by Mr. Nicholls.

PRESIDENT: First I want to correct a statement of Mr. Anderson. I am often kicking, but I assure you I never kicked as hard as he intimates.

Mr. Nicholls can you give us some additional light on the matters Mr. Anderson suggests?

MR. P. NICHOLLS: As it is getting rather late I shall not take the time to answer them all. The question of efficiency would make one or two talks in itself. If I should start to talk about powdered coal I would have to be very circumspect as to what I say. The introduction of the method of burning coal in the form of powdered coal was the means by which it was brought home to the manufacturers of appliances that they had not yet got to the limit of the efficiency that they could get. They said twenty years ago, "We have done very fine in the last few years and we can not hope for very much improvement in the future," but the actual amount of improvement you have seen illustrated in the pictures and we can still hope there is room for more. In the present state of the art they also generally say: "We have got up to a combined efficiency of boiler and turbine of about 30%. That is 30% of the heat in the coal is burned out as electric power and it looks as if we might possibly get up to 34%." But we can not believe that our successors will not do better than we have done, as we have done better than our predecessors, and they will find ways of getting up decidedly above 34%. At least we will be willing to credit them that they will do it. In the introduction of the new idea the Bureau very properly took a very active part. Now that it has become a commercial venture, there are those who advocate the burning of coal in that way and there are those who argue for the burning of it another way, and we can leave it to natural competition. You can find discussions of it in all the journals, but it will be agreed that powdered coal has been a very great addition to our technique, at least permits the burning of coals of a low grade that we could not burn in other ways. Undoubtedly there are methods by which it can be improved even above what it is now.

Regarding the efficiency possible in smaller power plants, it has been our function to show that improvement is possible and to widely disseminate this information. Having sown this seed, it is largely up to the manufacturers and purveyors of power house apparatus and instruments to build on this and demonstrate the returns that can be obtained from investments in these. The operators in such plants can improve the efficiency considerably by due care and watchfulness, but it is necessary that they have the best appliances before they can obtain the best results.

Regarding the available water power, the figures that Mr. Anderson gives are of the right order and although there is yet considerable undeveloped, certainly there is not sufficient to enable us to do without coal. It was stated that an efficiency of 93% had been obtained in converting the available power in the water used from a water fall, against 30 per cent of the available energy in coal. It can hardly be expected that the percentage efficiency of water turbines can go very much higher, but it may be expected that means will be found to use a greater proportion of that in the coal. Whether it will be by burning the coal, or whether it will be through the intermediary of steam, or whether it will be a more direct utilization is for the future.

I see many people here who could add to the discussion. Prof. Endsley, is it possible you have nothing to say?

PROF. L. E. ENDSLEY: I want to say that I have enjoyed very much this very interesting paper and pictures. I would like to have these pictures to run before a class I have out at the University on heat and power—we used to call it thermo-dynamics. It is very interesting and the average person does not appreciate that the power plants in the city of Pittsburgh are furnishing light for an entire average home for a month for the amount of coal you could put on a big shovel. Stop and think of that, one big shovel of coal will furnish the average home in Pittsburgh with light for a month. When we can do that, we know that some efficiency has been obtained in the power plant. I can only add that I am glad to be here to see this very excellent demonstration of what is being done and what can be done in the way of the production of power at a low cost.

PRESIDENT: Mr. Wildin, may we hear from you?

MR. G. W. WILDIN: I haven't very much to say about power plants that would add to the information given in the splendid paper of the evening. I think the majority of the members present have lived through the period covered by the pictures, and they revisualize very vividly to those who have been in the engineering field the progress that has been made. I want to say, as Mr. Endsley has said, that I have enjoyed this evening more than anything I have enjoyed in our Club for many a day. I think this Club is extremely fortunate in having Mr. Nicholls to present this subject tonight.

PRESIDENT: Mr. Lynn, we have not heard from you.

MR. SAMUEL LYNN: I do not know that I can add anything except to say that I want to voice the sentiment expressed by Professor Endsley and Mr. Wildin. I have certainly enjoyed the evening. I was very much interested in the presentation of the subject and in my opinion the pictures produced a wonderful effect on all of us. I was just trying to figure out in my own mind whether the train as shown in the picture is not one of the P. & L. E. 7,000-ton trains that we haul on our railroad, and by the way, I might state here that we also hold the record for a low coal consumption and I was wondering whether or not Mr. Nicholls did not use one of our long trains to make this picture.

PRESIDENT: I see Mr. Orchard back there. I wonder if he has anything to tell us about what we may look forward to at the next meeting.

MR. CHARLES ORCHARD: The next meeting is in the fall and I had hoped that the Subjects Committee would have three months' rest before we get busy again. It is too early yet to say anything about what to expect for next season. We have had a very active season and have had several disappointments, but we have always been helped out by the Bureau of Mines. We are very glad indeed to have had Mr. Nicholls for this meeting and to secure these pictures for their initial showing.

MR. LYNN: Unless there is further discussion, I think a rising vote of thanks of this Club is due to the speaker of the evening for his able presentation of the paper and the pictures and I would so move.

PRESIDENT: I will be glad to put the motion at the end of the discussion, but we want to hear a little more on the subject of this evening and we would like to hear from Mr. Howe.

MR. D. M. HOWE: What I don't know about power and heat would fill a very large volume. However, I think any intelligent man would be very much interested to hear what we have heard and see what we have seen here tonight. Mr. Nicholls deserves a great deal of credit indeed for what he has done. I have always been interested in the Bureau of Mines. My former residence was in Washington and I saw a great deal of such things there and more of it here. As long as we can have such talks and pictures as these we will feel that the Club is worth while.

PRESIDENT: Is Mr. Winslow in the room? We would like to hear from him.

MR. S. H. WINSLOW: Prof. Endsley made a statement that impressed me greatly. He stated that they could light a home in Pittsburgh for a month on a shovel of coal. I wonder if he meant a P. & L. E. shovel or a steam shovel. If he means a P. & L. E. shovel,who gets the other $3.85?

PRESIDENT: That gets down to a mechanical problem and we need additional information.

PROF. ENDSLEY: I did not mean a sugar scoop; I meant a large one. If a man used 50 k.w. a month it takes only about fifty-five pounds of coal to produce it. In fact my guess would be that 35 or 40 k.w. would be nearer the number used by the average family, and I could put that on a scoop. A fifty-pound scoop is not so very large. It was not so large when I used to shovel corn on the farm, but it did get pretty large along toward evening. But one and one-tenth pound of coal per kilowatt is about what it takes to furnish light. As to that other $3.85, spoken of, do not forget that it cost millions of dollars to procure it that cheaply, besides the coal.

PRESIDENT: If there is no further questions, Mr. Lynn's motion for a vote of thanks to the speaker of the evening is in order.

MR. ANDERSON: Before putting that motion, I think we should recognize the work of this Committee on Subjects, Mr. Orchard and his Committee, in getting Mr. Nicholls and the other speakers we have had during the past year. I would like to amend Mr. Lynn's motion by the addition of Mr. Orchard's committee.

MR. LYNN: I will be very happy to accept the amendment.

PRESIDENT: You have heard the motion as amended. What is your pleasure?

The motion prevailed by a unanimous rising vote.

PESIDENT: Mr. Nicholls, you have the thanks of our Club.

MR. NICHOLLS: The pleasure is entirely mine. Any time we can serve you, feel assured that we will gladly do our best.

PRESIDENT: Mr. Orchard, will you kindly convey to your Committee the sense of this motion?

MR. ORCHARD: Yes, sir. I thank you.

Upon motion, adjourned.

J. D. CONWAY,
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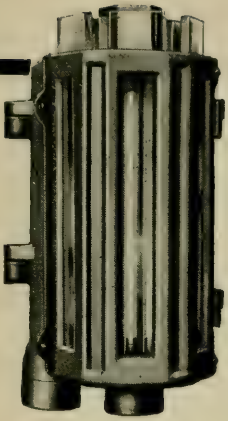

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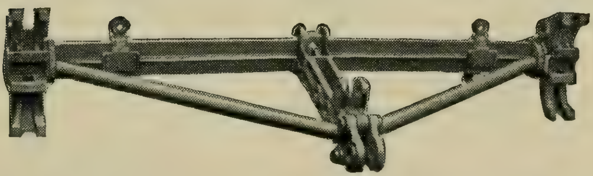

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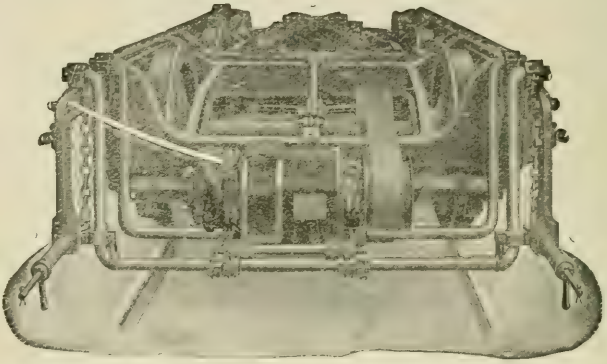

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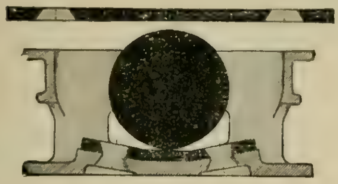

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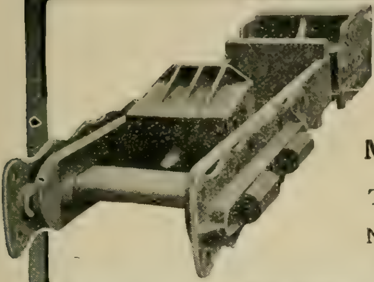

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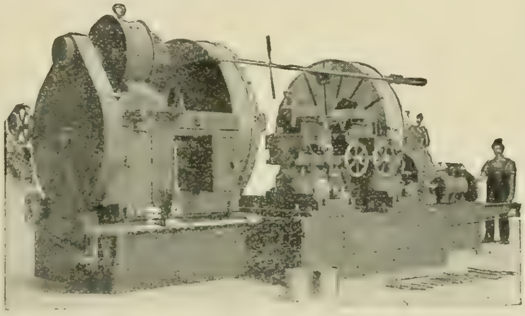

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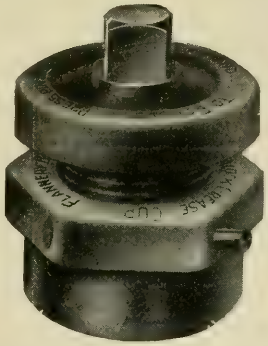

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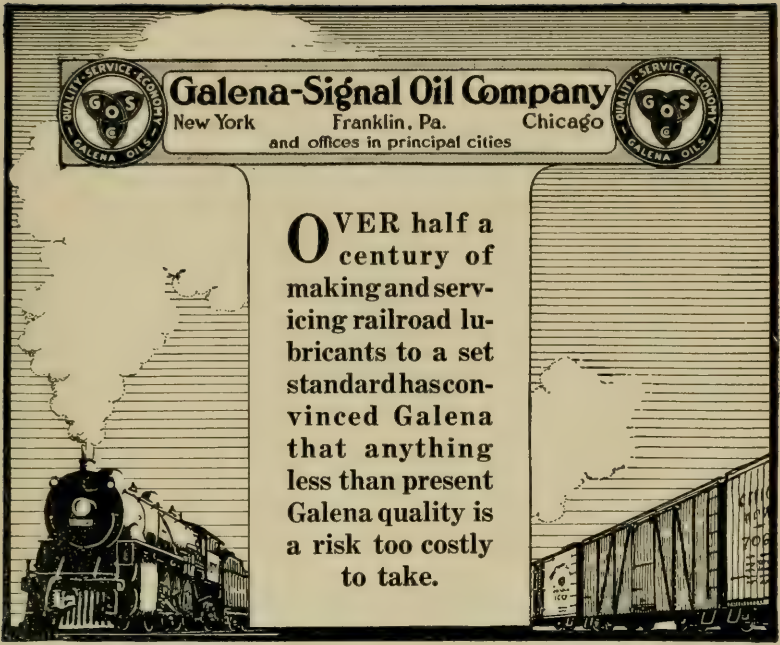

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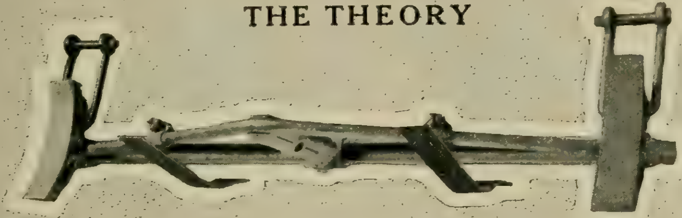
INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	viii
American Brake Shoe & Foundry Co.	iii
American Locomotive Co.	vi
American Steel Foundries	xvii
Baldwin Locomotive Works	viii
Ball Chemical Co.	v
The Bradford Corporation	ix
Brady Brass Co.	Front Cover
Chicago Railway Equip. Co.	xiii
Davis Brake Beam Co.	i
Dearborn Chemical Co.	iv
Flannery Bolt Co.	x
Fort Pitt Malleable Iron Co.	xi
Galena-Signal Oil Co.	xi
The Gould Coupler Co.	ii
Graham Bolt & Nut Co.	Front Cover
Grip Nut Company	xix
Hagan, George J. Co.	Front Cover
Hunt-Spiller Mfg. Corporation	x
Johns-Manville, Inc.	xvi
Johnson Bronze Co.	i
Locomotive Stoker Co.	xv
McConway & Torley Co.	xv
National Malleable and Steel Castings Co.	iv
Niles-Bement-Pond Co.	vi
O'Brien, Martin J., Co., Incorporated	Front Cover
Paxton-Mitchell Co.	iv
Pgh. Testing Laboratory	Front Cover
Pressed Steel Car Co.	xix
The Q. & Co.	ii
Railway Equip't. and Publication Co.	iii
Railway Steel Spring Co.	xvi
Safety Car Heat. & Lighting Co.	xvi
Schaefer Equipment Co.	v
Sipe, James B., & Co.	iv
Southern Wheel Co.	iii
Standard Safety Nut Corp.	Front Cover
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	iii
The Superheater Co.	Front Cover
Suydam, M. B., Co.	Back Cover
The Symington Co.	v
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xviii
U. S. Metallic Packing Co.	xvi
Vapor Car Heating Co., Inc.	xviii
Westinghouse Air Brake Co.	vii
Westinghouse Elec. & Mfg. Co.	vii

THE THEORY



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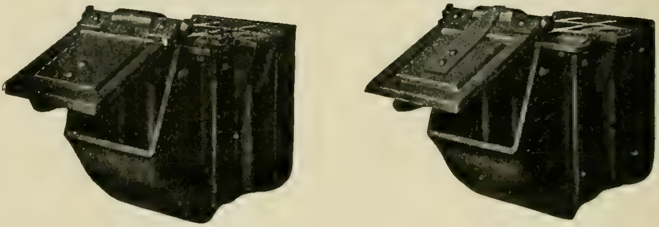

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No. 8

Pittsburgh, Pa., September 24, 1925.

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GEORGE D. OGDEN	November, 1923, to October, 1924

*—Deceased.

Meetings held fourth Thursday of each month except June, July and August.

PROCEEDINGS OF MEETING

September 24th, 1925

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., at 8 o'clock, P. M., President A. Stucki in the chair.

The following gentlemen registered:

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Donovan, J. J.
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Fair, Charles
Farrington, A. R.
Farrington, R. J.
Frey, A. R.
Fritz, A. A.
Gallinger, George A.
Geddes, James R.
Gerard, F. R.
Gilg, Henry F.
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Glenn, J. H.
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Hale, Charles E.
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Headington, R. V.
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Hoover, R. C.
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Hykes, W. H.
Inks, S. W.
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Kilmer, George
Kindle, W. F.
Koch, Felix A. C.
Krause, H. A.
Kroske, J. F.
Kummer, Joseph H.
Kunkel, H. C.
Lanahan, J. S.
Lanahan, Frank J.
Laughlin, Harry
Laughner, C. L.
Laurent, G. F.
Laurent, Joseph A.
Lawson, A. F.
Lawson, A. T.
Lee, L. A.
Lobez, P. L.
Lowe, W. D.
Ludgate, B. A.
Ludwig, C. F.
Lynn, William

Marlow, George A.
Marshall, W. T.
Matchett, H. K.
Miessner, V. H.
Miller, J.
Milliken, James
Mitchell, F. K.
Mitchell, W. S.
Minnick, F. G.
Morse, J. W.
Moyer, Oscar G. A.
Muir, R. Y.
Myers, Arnold
Myers, W. H.
McGeorge, D. W.
McNiff, John L.
Obermeier, L. J.
O'Leary, J. J.
Orchard, Charles
Parke, F. H.
Passmore, H. E.
Pehrson, A. K.
Penn, William
Perkins, H. E.
Pickels, H. D.
Posteraro, S. F.
Provost, S. W.
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Woodling, George V.
Wright, Edward W.
Zeher, W. G.
Zimmer, A. E.
Zulaby, Elmer W.

PRESIDENT: The Roll Call will be dispensed with, the record of attendance being had from the registration cards.

If there is no objection, the reading of the minutes will be dispensed with, as the printed Proceedings have been in your hands for some time.

The Secretary read the following list of applications for membership:

Angstadt, Edward D., Piece Work Inspector, P. & L. E. R. R., 3121 Brunot Avenue, Corliss Station, Pittsburgh, Pa. Recommended by K. Berg.

Beach, Earl B , President, Earl B. Beach Company, Oliver Building, Pittsburgh, Pa. Recommended by J. A. Ralston.

Gray, Robert H., Clerk, Efficiency Department, Mon. Con. R. R. Co., 2701 Perrysville Ave., N. S., Pittsburgh, Pa. Recommended by C. M. White.

Haskell, B., Mechanical Engineer, Box 522, Franklin, Pa. Recommended by H. E. Passmore.

Hepplewhite, M. R., District Passenger Agent, P. & L. E. R. R., 6022 Jackson Street, E. E., Pittsburgh, Pa. Recommended by F. H. Stark.

Hollen, C. O., Salesman, Ridge Tool Company, 1254 Goe Avenue, N. S., Pittsburgh, Pa. Recommended by F. H. Stark.

Kerr, Jr., Charles, General Engineer, Westinghouse Electric & Mfg. Co., 439 Rebecca St., Wilkinsburg, Pa. Recommended by H. H. Sener.

Lewis, J. W., Office Manager, Railway Dept., Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Recommended by A. P. Schrader.

Lindberg, Wilmer N., Chief Clerk to Storekeeper, Union Railroad Co., 508 Locust St., McKeesport, Pa. Recommended by A. F. Coulter.

Marshall, Craig W., Eastern Sales Manager, Sunbeam Electric Mfg. Co., 1720 Grand Central Terminal, New York, N. Y. Recommended by G. M. Basford.

Miles, Harry E., Chief Clerk to Supt., Union Railroad Co., 5431 Claybourne St., Pittsburgh, Pa. Recommended by A. F. Coulter.

Miller, L. L., Receiving Clerk P. & L. E. R. R., 2900 Merwyn Ave., Pittsburgh, Pa. Recommended by William Penn.

Mycoff, George H., Round House Foreman, Mon. Con. R. R. Co., 505 Flowers Ave., Hazelwood, Pittsburgh, Pa. Recommended by C. M. White.

Reese, Oliver P., Supt. Motive Power Penna. Railroad System, 502 Pennsylvania Station, Pittsburgh, Pa. Recommended by J. L. Cunningham.

Reifsnyder, J. W., Mechanical Engineer, Pittsburgh Testing Laboratory, Stephenson & Locust Sts., Pittsburgh, Pa. Recommended by J. Milliken.

Rodman, C. J., Chemical Engineer, Reisert Automatic Water Purifying Co., 604 Chamber of Commerce Bldg., Pittsburgh, Pa. Recommended by C. M. White.

Sanfillip, P. C., Electrical Stockkeeper, P. & L. E. R. R., 112 Star Way, Pittsburgh, Pa. Recommended by William Penn.

Whalin, J. P., Salesman, Carbo-Oxygen Company, 838 Seventh Ave., Coraopolis, Pa. Recommended by F. H. Stark.

PRESIDENT: These applications will be referred to the Executive Committee in due course, and upon approval by them, the gentlemen will become members without further action than the payment of the current year's dues.

The Secretary announced the death of the following members: H. B. Pierce, Howard L. Beach and Edward W. Newell.

PRESIDENT: Appropriate memorial will appear in the Official Proceedings of the Club. Is there any new business?

SECRETARY: A proposed amendment to the Constitution has been received, as follows:

AMENDMENT TO CONSTITUTION

The undersigned offer the following amendments to the Constitution of the Club:

CONSTITUTION—ARTICLE IV—OFFICERS: Recommended that Finance Committee be changed to read—"consisting of five or more members."

Membership Committee to be changed to read, "consisting of seven or more members."

Reception Committee be changed to read, "consisting of six or more members."

Subject Committee to be changed to read, "consisting of three or more members."

The term of office of the Finance, Membership, Reception and Subject Committees shall be specified at the time of the Annual Election, but the term of office of the members of the Committees named shall not exceed three years.

D. J. Redding,	Louis E. Endsley,
G. W. Wildin,	Chas. Orchard,
D. M. Howe,	K. Berg,
E. C. Sattley,	W. S. Marshall,
D. F. Crawford,	F. H. Stark.

PRESIDENT: This amendment will lie over until the next meeting for action.

As this is the meeting at which, under our rules, a Committee on Nominations must be appointed to make nomination of officers for the ensuing year, I will appoint as such Committee Messrs. D. M. Howe, D. F. Crawford and Karl Berg, and I would request the Committee to confer during the course of the evening and report later at this meeting.

The next order of business is the presentation of the paper of the evening, which is by Mr. L. K. Sillcox, General Superintendent of Motive Power of the Chicago, Milwaukee and St. Paul Railway, on the subject, "The Utilization of Freight Train Cars from the Standpoint of Design, Maintenance and Loading." Mr. Sillcox does not need an introduction to you. He is known from coast to coast, and it is a great pleasure to have him with us. Mr. Sillcox:

UTILIZATION OF FREIGHT CARS

From the Viewpoint of Loading, Design and Maintenance

By L. K. SILLCOX,
General Superintendent Motive Power, C. M. & St. R. Ry., Chicago, Ill.

A maximum utilization of freight train cars can be closely approached when that performance whereby, first, the greatest amount of tonnage is carried in relation to the weight and capacity of the car and, second, that with this favorable relation, the mileage per day, per month or per year under load be as great as it is possible to obtain. From this it will be seen that, first, the necessary availability of equipment, capable of meeting modern service requirements is essential, and, secondly, an high standard of current maintenance, as well as a policy calling for the strictest application of the same, is necessary. Through these means, it would appear reasonable to conclude that a maximum number of car units would be made properly available the greatest possible number of days throughout the year. In other words, our aim should be in the direction of having the net ton mileage increased and the tare weight employed decreased in proportion; besides, wherever it can be done, the net ton miles per car mile should be improved upon. Any definition of this subject must naturally be extended to imply that the net ton mileage shall be the maximum, the tare ton mileage shall be the minimum and the investment for the necessary facilities and equipment shall not be greater than intensive continuous use would prescribe within the bounds of possibilities obtaining.

Data is now furnished showing the miles per day per locomotive and per freight car. The manner in which the information is compiled is sufficiently divided to enable it to be worked into several factors. We have attempted to gauge the performance on the basis of miles per day per locomotive or freight car on line and as a result we have what may be termed a statement of the performance in relation to equipment at hand rather than a statement of performance of the units actually in service, excluding those stored serviceable or awaiting repairs, etc. In the case of freight cars, it would be necessary to know, each day, the number out of service for repairs as now shown on the usual form of bad order reports, the number stored serviceable and the number in actual service. When divided in this manner, it is then possible to analyze the performance by hours per day to indicate the dead time encountered in train movements, because this lost motion affects the utilization of cars, on the one hand, and, it is further aggravated by improper facilities respecting sidings, yards, terminals, etc., on the other hand. If we attain the greatest possible net ton mileage with the least actual number of freight cars and freight car miles, then we have a measure of performance which is of benefit to those administering car distribution or those who may largely control the utilization of the same. If we know that we are handling a certain tonnage with fewer cars today than heretofore, then we should know by what means this is accomplished, so that proper elements may be set up for further improvement.

The primary requisite for an high degree of utilization of freight cars is a condition of favorable road characteristics which permit trains to move without interruption between terminals at a uniform speed. The average speed is now about 12 miles per hour for freight trains, meaning that the distance run between terminals is consumed on this basis, but that at certain intervals a much greater speed is attained in order to maintain the average named. The limitations placed upon freight car utilization are for the most part, not due so much to the character of the equipment as to the obstructions in yard, terminal and road handling.

In the past 20 years there have been great strides in the matter of increased transportation efficiency, giving rise to the use of larger locomotives and freight cars of greater capacity. This has resulted in increased tonnage per train, reduced train crew expense per train mile, per train hour, etc. Problems affecting the size and type of power and freight cars apply to road characteristics in the matter of grades, curvatures, bridge limitations, tunnel clearances, train assembling, yard and siding facilities (required to be large enough to handle full tonnage trains without breaking up, doubling over or sawing by), methods of signaling, dispatching, tonnage rating, distance between terminals, etc.

The distribution of cars as to types and capacity is vital in attaining greater utilization. The policy of routing cars of certain types together with the practice of purchasing and owning cars adaptable to the service are so vital in the general scheme of having an high degree of utilization that this subject could be dwelt upon within itself if, time and space permitted.

As yet, no definite formula has been devised so that it could be used to arrive at a proper ownership of freight cars expressing quantity, capacity, type, etc. Where there is a lack of definite policy along this line, it has been due to the fact that freight cars are readily interchanged, making it possible to draw from the general supply of rolling stock in the country. This allows an element of flexibility with regard to supply irrespective of ownership, and, although it would seem that when these cars are no longer needed and per diem forces them in the direction of home, it has been found that over long periods of time such apparently unnecessary empty movement usually is in the direction required ultimately to maintain an even balance and proper distribution of cars throughout the country. Conditions are still such that approximately 70 per cent of the total traffic handled in the country moves eastward and 30 per cent moves westward so that we always will have before us some empty car mileage. We are not considering this empty car mileage as coming within the principles of utilization of freight cars other than to maintain proper distribution.

There are two general classes of carriers throughout the country in relation to car ownership. One class owns more cars than the average requirements of the line and the other owns fewer cars than the average. The number of cars to be owned by any carrier is usually affected by the yearly per diem balance. The carrier having a large per diem balance to pay will usually increase or decrease ownership in relation to what it costs per day to own, maintain and operate freight cars. Per diem has been determined largely upon the average investment per unit covering a wide range of price periods or from 1914 to 1920 and then to date. Equipment purchased during 1919 to 1921 involved a purchase price which, when considering interest, depreciation, taxes, insurance, maintenance, etc., now costs slightly more than is provided for by per diem. On the other hand, considerable equipment is still in service which was purchased prior to the rise in prices and, therefore, whatever may be lost in owning high priced cars is usually more than offset by the per diem paid for low priced cars. It is the general opinion now that, even though the high priced car may involve more than is received for per diem, the possibility of its greater use, because of lesser maintenance requirements, is such that it is not a matter of per diem, but a question of earning power. It is not considered, therefore, that per diem is the proper basis of determining ownership.

The amount of freight equipment in the country today is the result of a variety of policies. It is presumed that the administrative methods employed were merely influenced by periods of car shortages and surpluses. This is not so great an element in the question of proper ownership today because there is an ever increasing efficiency in the matter of car distribution throughout the country as a whole. The result is that car shortages are decreasing and car surpluses are increasing, even in the face of more traffic to be handled. Therefore, the improvement in methods of distribution makes it unnecessary to increase the total number of cars available for service, but rather to replace worn out cars with new units of greater capacity and availability. The increase in the average capacity of freight cars has been 60 per cent since 1902 or from 28.1 tons to 44.6 tons. If we are to attain greater utilization of cars, the increase in capacity will permit this and, at the same time, will require relatively fewer individual units for the service.

We have before us, in this discussion, the question of the general performance of equipment as a whole throughout the country. If the art of design and construction were to develop uniformally, the equipment would reach the obsolescent state at the same time and the problem of overcoming obsolescence by retirements, rather than by improvements, would be greatly simplified. In the past ten years, however, the practice has been to overcome partial obsolescence by improvements, so that the life cycle is indefinite and the character of equipment as to design and construction is not uniform. In this way, there is not as rapid an increase in the average capacity of freight cars as would otherwise be the case. The obsolescence referred to is more in the nature of design than resulting from deferred maintenance.

Beyond this we have the problem, not so much of respecting the number of cars involved, as the distribution by types. Some carriers have a large majority of open top cars while others may require a large number of house cars. The question of ownership is usually affected by the prevailing character of commodities handled. Loading in general, or by commodities in particular, is not uniform throughout the year, so that carriers are confronted with high and low peak seasons. If the traffic on each line were confined to cars owned by that line, this would require an ownership capable of taking care of the peak load, so that there would be no shortage throughout a large portion of that time. On the other hand, the interchange of cars is such that ownership for peak loading is not always required, and, it is this particular feature of car ownership from which results a greater flexibility.

Comparisons based on the amount of investment in freight cars in relation to the performance as to net tons, miles per unit, or some other such factor, are quite often prepared, much as in cases which apply to the utilization of power, wherein there is a factor in the relation of miles per day per locomotive owned and miles per day per locomotive used, we also have to consider some such feature as regards freight cars. However, mileage is so low in freight car performance that to present a factor of relationship of miles per car in service as compared with miles per car on line would not be of any particular moment. We can consider a rather definite factor in the following comparison based on units and capacity of freight cars, thus representing the relation of the carrying capacity requirement, the number of units, the capacity per unit, the investment cost, and the maintenance:

EXHIBIT 1.

		A	B	C
1.	Nominal capacity	50 ton	40 ton	30 ton
2.	Limit load on rail in pounds	169,000#	136,000#	103,000#
3.	Aver. light weight in lbs.	46,000	42,000	36,000
4.	Load carrying capacity in lbs.	123,000	94,000	67,000
5.	Total ton load carrying capaity required	2,400,000	2,400,000	2,400,000
6.	No. of cars involved	39,025	51,064	71,642
7.	Average investment cost per lb. of Lt. Wt.	3⅓c	3⅓c	3⅓c
8.	Value per car	$ 1,532	$ 1,399	$ 1,199
9.	Total investment	59,786,300	71,438,536	85,898,758
10.	Interest at 6%	3,587,178	4,286,312	5,153,925
11.	Net interest saving	1,566,747	867,613	
12.	Maint. cost @ 12% of investment cost	7,174,356	8,572,624	10,307,850
13.	Aver. per car per yr.	184	168	144
14.	Saving in Maint.	3,133,494	1,735,226	
15.	Depreciation, ins., taxes, etc., at 2½%	1,494,658	1,785,963	2,147,469
16.	Saving in dep., ins., & taxes	652,811	361,506	
17.	Summary of savings	1,566.747	867,613	
		3,133,494	1,735,226	
		652,811	361,506	
		$ 5,353,052	$ 2,964,345	

In this illustration it is assumed that the carrying requirement was 2,400,000 tons and that this would be provided either by 30, 40 or 50 ton units. Of course, with larger units it is necessary to provide a smaller number than in the case of smaller units. This is illustrated by Item 6. The average weight per car of different capacities is merely a rough estimate representing all classes of freight cars. This also applies to the average cost per pound and per car, which may be higher for certain classes of cars and possibly lower for other classes of cars. Whether the estimated costs are high or low in this case does not affect the final results materially, nor does it affect the stated savings, because these factors change the results but to a small degree.

In this statement the maintenance is estimated at 12 per cent of the cost of the car per year. The depreciation, insurance and taxes are stated here at the rate of 2½ per cent of the investment. In this respect there is no uniformity of practice, some carriers using 1 per cent or less for depreciation alone, while others employ from 4 to 5 per cent. Whatever rate is used, it reflects upon the final retirement figure, which is always a charge to operating expenses and a credit to the investment in order to write off the cost. If the case of any carrier could be stated definitely in this form, it would indicate that in the order of importance the possible savings would be in maintenance due to heavier and better cars, representing about 60 per cent of the savings, the reduction in interest amounting to about 28 per cent of the savings, and about 12 per cent representing a possible saving in depreciation, insurance, taxes, etc.

Therefore, there is involved in this question not only the number of cars to be operated, but the average capacity. In order to attain greater utilization of equipment, it would be possible, in theory, to reduce the number of car miles per day, per month or per year and increase the net ton miles with the larger car, provided the movement of commodities permitted of full loading and reducing the proportion of L. C. L. loading. The net tons per train have increased, in the past twenty years, far more rapidly than the cars per train. This improvement has been gradual. We may expect that commodities will be moved in such a manner as to permit increasing the average load per car, and with this movement the tendency towards providing larger and heavier cars is continued. In the past few years the average tons per car did not increase at the same rate as the average capacity per car. It should be understood that since the increase in the size of trains, the gross tons per train, etc., with the advent of larger power, it has been necessary to strengthen freight cars. It is, therefore, inconsistent to employ a mandatory strength requirement, if the capacity is not increased accordingly, because it is not economical to provide strength of members and fail to have capacity comply therewith.

In the past twenty years freight cars have increased in capacity, and consequently, in relative strength, about 60 per cent, whereas, during the same period average locomotive tractive effort increased 100 per cent, thus illustrating the great need of building up car members to meet such conditions. The average weight per car did not increase in the same proportion as the capacity.

Under present methods of recording miles per day per freight car it would appear that, considering a bad order situation of 8 per cent and an average mileage per car per day on line of 27, by deducting the 8 per cent we have an average mileage per serviceable car of 29 per day. Then assuming that the average speed of freight trains is 12 miles per hour and the distance run is 29 miles per serviceable car per day, this would result in an actual period of 2.42 hours in train service out of every 24 hours. This would leave 21.58 hours per day consumed in loading, unloading, switching and other time of an apparently unproductive nature. The above is based upon the action of serviceable cars, but, although not representing the actual condition, is merely offered as an illustration. If this were confined to cars actually in trains, it would result in more than 2.42 hours per movement or per day. Nevertheless, we are seriously confronted with the duty of attaining more miles per serviceable car and for that matter more miles for total cars.

The Mechanical Department is concerned in this performance in that more cars should be made available for service. It is economical to have a high degree of maintenance or a good condition of equipment. This is illustrated by the following:

EXHIBIT II

All Class Railroads—Period of 4 Years—1920, 1, 2 and 3.
(Based on I. C. C. Reports)

Carriers Having Per Cent of Bad Order Freight Cars.		Average Cost Per Car Per Year for Repairs
From	To	
0	5%	$151.
5%	10%	179.
10%	15%	186.
15%		187.

The records do show that the better equipment is maintained the less it will cost to keep in condition. Serviceable freight cars is a requisite of greater utilization; however, if the bad order situation is reduced, but the hours of service per car are not increased, then there is a lack of proper utilization. We have period surplus and periods of shortage and we have periods of peak load and periods of low load. It would seem that the policy recommended for locomotives could well be followed for freight cars in that when loading is low cars be set aside so that as few as possible will be in actual service. It is recommended that utilization of cars be interpreted to mean that the greatest amount of tonnage and mileage be attained with the least possible number of units.

The employment of freight cars, when based on net ton miles, can improve most effectively where the increase in the average capacity of cars and their assignment to the fullest possible loading is fully applied. The miles per run per load is a factor in this measure of performance or the utilization should express the load carried and the distance of same. Cars are now loaded to approximately 60 per cent of their capacity, but this factor cannot be considered as improper utilization since greater volume, in relation to weight, is experienced with certain classes of loading. Automobile and furniture loading will illustrate this point. The loaded car miles per loaded car per day is a measure well worth considering in attempting to increase the service of freight cars.

The per cent of loaded to total car miles is a very important feature in proper utilization in that, if the loaded percentage is small, the elements which build up revenues are not favorable. If the net tons per loaded car are high, but the percentage of loaded to total car mileage is low, then we still have a situation which is not favorable to intensive utilization. If the loaded movement is all one way, this also affects performance.

Where gross tons per train are high and the density of traffic requires a proper frequency of train movement, we should expect a high performance as to miles per day, but if the ratio of loaded to total car miles is low, even though the net tons per loaded car are high, there is an element lacking in permitting a full utilization of freight cars.

Efficiency in train assembling, dispatching, locomotive performance, freight car performance, etc., together with favorable road characteristics, is usually expressed by gross ton miles per train hour. It means large trains, uninterrupted speed, etc. A good performance in this respect should greatly facilitate the utilization of freight cars. The frequency of terminals where trains are broken up and re-assembled in a large measure determines the car movement because of the time lost at terminals. This is an element beyond the control of most carriers except that where terminals are more frequent than absolutely necessary. This greatly reduces the average movement of cars and the possibility of greater utilization. Fewer terminals and more road movement are essential for better performance. It is well to follow the principle of keeping yards clean of cars and having them moving on the road except, of course, in the case of cars stored awaiting service and in such a case these units should be closely held and carefully distributed in accordance with definite known requirements.

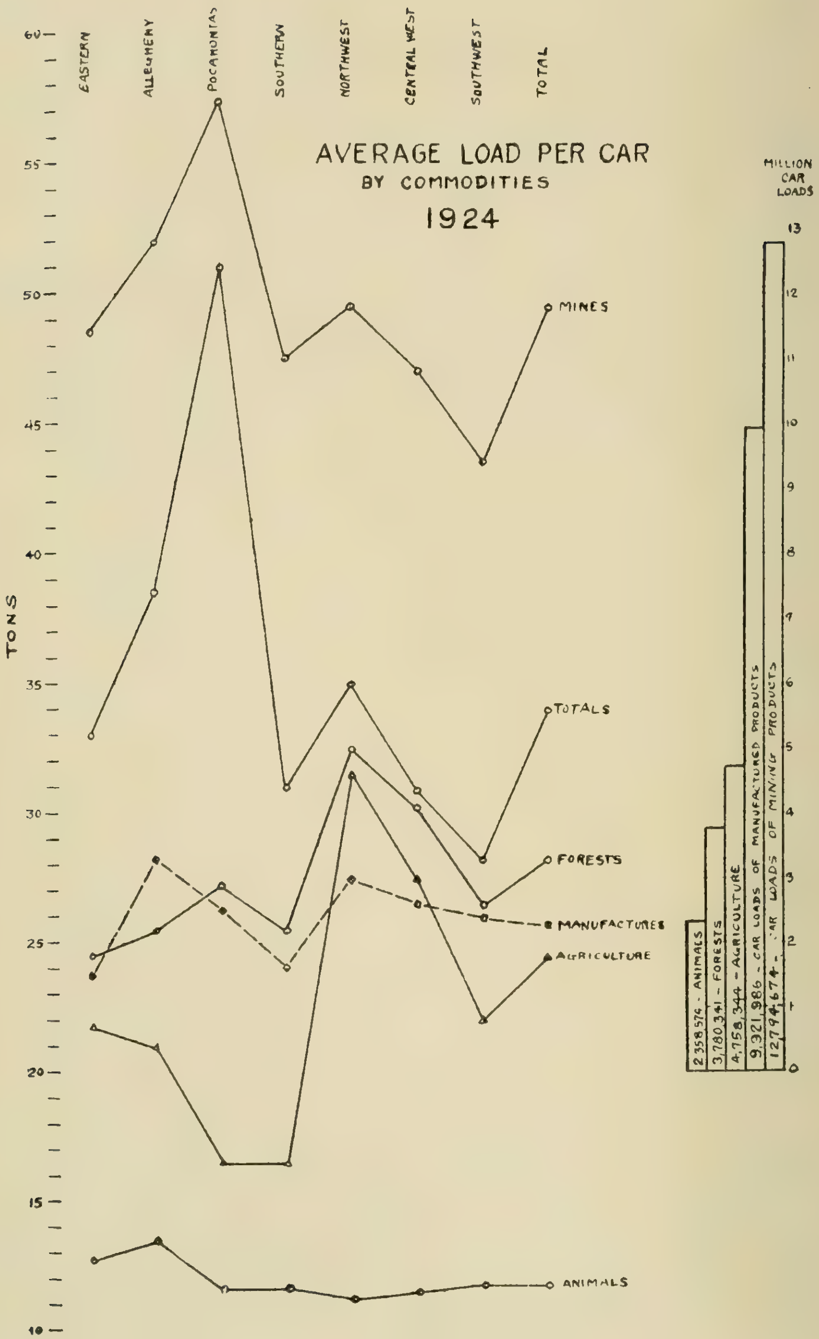
LOADING

The loading characteristics throughout the country indicate the heaviest tonnage to be in products of mines. Next in order come manufactured products, agricultural products, forest products and animal products. The number of car loads handled in 1924, together with the average load per loaded car, was as follows:

EXHIBIT III

Class	Loaded Cars Handled	Av. Load Per Car
1. Mines	12,794,674	48.5
2. Manufacturing	9,921.986	23.8
3. Agriculture	4,758,344	21.8
4. Forests	3,780,341	24.6
5. Animals	2,356,574	12.8
Total	33,611,919	34.0

Class 1 (Products of Mines) not only represents the greatest amount of tonnage handled, but permits of a heavy loading per car. This amounted to an average of 48.5 tons. Here we are permitted to load cars to full capacity with the possibility of decreasing car movement and car mileage by having cars of greater capacity or convertible type. On one line in the east, they have gone to the large dimensioned car very extensively and have some with a capacity of 120 tons. It is in this section of the country, as shown on the chart, where the average load per car ranges between 55 and 60 tons. The heaviest average tonnage per loaded car comes from iron ore mines and this amounted to an average of 53.5, tons with a range between 63.1 on one road to 43.1 on another, this depending upon the size of equipment offered by the various carriers for such loading. Bituminous coal offers the next highest average loading or 51.7 tons with a range from 72.0 to 26.2 tons. The spread is rather radical, but is due to the greater distribution of coal fields and a greater variety of equipment offered for loading. Bituminous


AVERAGE LOAD PER CAR
BY COMMODITIES
1924
TONS
60
55
50
45
40
35
30
25
20
15
10
EASTERN
ALLEGHENY
POCAHONTAS
SOUTHERN
NORTHWEST
CENTRAL WEST
SOUTHWEST
TOTAL
MINES
TOTALS
FORESTS
MANUFACTURES
AGRICULTURE
ANIMALS
MILLION
CAR
LOADS
13
12
11
10
9
8
7
6
5
4
3
2
1
0
2 358 574 - ANIMALS
3,780,341 - FORESTS
4,758,344 - AGRICULTURE
9,321,986 - CAR LOADS OF MANUFACTURED PRODUCTS
12794674 - CAR LOADS OF MINING PRODUCTS

coal loading constitutes approximately one-half of the total products of mines. Practically all of the products of mines require open top cars.

Manufactured articles occupy the second place in the total movement of car loads, but represent a very low average tonnage, this being 23.8. This is due to the character of the commodities in this group, most of which have a high displacement or require more space per pound of weight than products of mines. The greatest average loading in this group was represented by pig iron or 40.9 tons per car. Cement resulted in 38.0 tons per car. Most of the manufactured articles require house cars. Automobiles offer the least tonnage per car, this average being 8.2.

Agricultural products called for 4,758,344 loads, but gave an average of only 21.8 tons. The chart shows that the load is higher than the average in the Northwest region for the reason that wheat offers the heaviest tonnage in this group, or 40.8. Cotton is responsible for the lightest tonnage or 11.3. Products of agriculture require mostly house cars.

The products of forests offer only 28.1 tons per car, the heaviest being logs and the lightest miscellaneous lumber. This movement requires flat, gondola and house cars.

Products of animals offer a low loading, especially for live stock. Leathers and packing house products offer the heaviest loading, but the average for all is only 11.8 tons.

The chart shows the average load per car by commodities for 1924 and illustrates the section of the country offering the heaviest loading. The average load of mining products is high in the Pocahontas District, but here agricultural loading is very low. In the Northwest District, agricultural loading is very high compared with the average.

No reference is made here to the demands of shippers as to average car load, but it would appear that in bulk commodities there would be no objection to larger cars. The minimum capacity coal car should be 50 tons. Anything less does not represent economical movement.

DESIGN

Until recently the question of design and interchangeability of parts, while covered in a general way in the ARA Manual, was not extended to various members in the body. Standard designs are being fully worked out with a view to attaining the greatest possible strength and capacity with the least possible weight. The tendency is to increase the capacity of cars, which places upon all concerned the duty of increasing the performance of each car required for loading. The tare weight is a feature of design which has been given much consideration. The tare weight of low capacity cars is greater than high capacity cars when measured by tons capacity. This is shown in the following statement in a very general way:

EXHIBIT IV

Nominal Tons Capacity	Tons Av. Weight Loaded	Tons Av. Tare Weight	Percent of Tare to Total	Percent of Carrying Capacity to Total Weight
30	48	18	37.5%	62.5%
40	61	21	34.4%	65.6%
50	73	23	31.5%	68.5%

These figures represent stenciled capacity and make no allowance for permissible axle loads. From this it may be stated that the percentage of dead weight decreases with the increase in capacity, or in other words the non-productive weight does not increase in proportion with the capacity. This is another argument, especially when actual allowable axle loads are considered, for larger but fewer cars to handle the traffic wherever loading will permit.

The rolling friction increases as the number of bearing surfaces increase. The following exhibit shows how this is worked out:

EXHIBIT V

Variation in Resistance in relation to variation in light weight of Freight Cars

Tons Light Weight Per Car	Percent Increase	Pounds of Resistance Per Ton Weight of Car	Total Resistance for Light Weight of Car or When Empty	Percent Increase
20		7.00	140.00 lbs.	
25	25.00%	5.89	142.25 lbs.	1.4%
30	50.00%	5.13	153.90 lbs.	9.0%
40	100.00%	4.20	168.00 lbs.	20.0%
50	150.00%	3.64	182.00 lbs.	30.0%
60	200.00%	3.27	192.20 lbs.	40.0%
70	250.00%	3.00	210.00 lbs.	50.0%

The per cent of increase in resistance is about one-fifth that of per cent increase in weight.

Wind friction is reduced with fewer though larger cars per train.

Design is mostly concerned, however, with strength of materials and with the arrangement of parts. The objective should be to provide a unit which will run, as a whole, from one heavy repair to another with a minimum of intermediate attention.

The question of larger cars is also involved. Where there are fewer larger cars constituting a train, the length is less for the tonnage carried. This also simplifies the making up and breaking up of trains as there are fewer cars to handle. The following is an example of how the length of trains is effected by the length and size of cars:

EXHIBIT VI

Tons Capacity	Av. Length Per Car	No. of Cars Required Based on a 3,000-ton Train	Length of Train— All Cars of Same Length	Per Cent Reduction
30	36	100	3600	
40	38	75	2850	20%
50	40	60	2400	30%

One of the difficulties of operation is due to terminal congestion and investment, and a relief of some twenty to thirty per cent should be desirable by this means, where possible.

MAINTENANCE

It is usual to judge maintenance by the bad order car situation. If we were in a position where a constant car shortage existed, then the question of the number of days cars are detained for this purpose would be of extremely great importance.

There is now developing a greater tendency towards making classified repairs to freight cars on somewhat the same principle as applies to locomotives. The latest development along this line is to provide facilities and forces so as to run a great number of cars of the same type and design through shops in a short period of time doing practically the same amount of work on each car. Where this work is heavy enough, it should finally result in a service cycle between classified repairs of approximately eight years. This should be done with a view to reducing intermediate light and running repairs in the meantime. In the long run this will result in providing more service days per car. The development of lay-outs and spacing of car repair terminals has been gradual, but not always according to a specific plan. For this reason, much remains to be done in the matter of location and type of facilities for freight car repairs. A system having 80,000 cars and an average cycle of eight years between heavy repairs would have to run 10,000 cars through the shops each year provided the repairs came due in order. With facilities adapted to such a plan, it might be found that the number of light and running repair points could possibly be reduced, especially, if a plan could be worked out to have greater distances between train classification terminals and, where facilities are constantly employed.

While we are wrestling with causes, methods, fundamentals and ultimates, it would be well if we could rearrange our thinking on a factor which exerts a primary, as well as, a more direct influence than any other feature on the efficiency with which shop operations are handled, namely, that of employing a minimum steady satisfied force, also a minimum number of thoroughly modernized plants and having car maintenance work handled in an orderly fashion throughout the year rather than the method most generally prescribed, that of following seasonal demands. If we are to effect the greatest return from a minimum force of men, the least outlay for fixed facilities, and the smallest number of cars to handle a given volume of business, such a plan should receive careful thought. This necessitates the preparation of a budget in which the funds available are allotted to those projects which it is considered most important to carry on. When this budget is approved and the amount of work to be done fixed, it is then necessary to prepare a program or schedule for the projects considered if it is to be done to the best advantage. It is highly essential that the budget be approved and the program completed sufficiently in advance to enable the materials to be assembled and the forces to be organized to do the work in a logical fashion.

It is equally important that the executives and all the other officers adhere to this program as strictly as possible, for if deviations in even relatively unimportant details are allowed, the entire program will soon become ineffective through other and more serious interruptions. It often happens that the most serious fluctuations which occur in forces are due to variations in earnings and without regard to the most economical season and manner of conducting the work. Again, seasonal characteristics, particularly in the more northerly climates and where facilities are not available to offset the effect of the same, make a uniform force impractical, although not to a degree commonly believed. It appears to be more or less general practice to do the maximum amount of work when traffic is heavy and earnings are good, although it is at this time that men and materials are most difficult to secure and equipment is in extreme demand. The loss which results from this practice is not fully realized, otherwise, the continuance of this condition would not be allowed to the extent that it is so often practiced. Even though the financial condition of some roads may make the method necessary, it is not true in every case and, in view of the possible savings and maintaining orderly production throughout the year, it should be acceptable to forego possible adverse results in net earnings, for certain months, in order to secure improved earnings at the end of the year. A budget may be prepared for the year, sub-divided to indicate the expenditures to be made each month and then authorized in its entirety; or it may be authorized from quarter to quarter, handled in such a way that the expenditures for each month may be authorized by quarters. Thus, at the beginning of the year, a budget would be prepared for the entire year and the expenditures required for the first three months would be authorized accordingly. Prior to the end of the first quarter the budget for the year could be allocated to the second three months and appropriations made accordingly. While this gives an opportunity to adjust the program for changes in traffic quarterly, it also allows reasonable certainty of the continuity of a program for at least three months.

The greatest utilization of the individual car is to be attained by having the best design, the best and most economical plant of current maintenance and the application of principles of distribution together with a unit capacity, which will permit a given traffic to be hauled with the least possible number of units.

PRESIDENT: It was certainly a great pleasure to listen to Mr. Sillcox's paper tonight. The subject is timely and important and deals with a question in which we all are interested. Before calling for general discussion of the paper, we will hear the report of the Nominating Committee.

MR. D. M. HOWE: The Secretary has the Report.

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George W. Wildin, Gen. Mgr., Westinghouse Air Brake Co.

Second Vice President

J. L. Cunningham, Supt. Motive Power, Penna. Railroad System

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Samuel Lynn, Master Car Builder, P. & L. E. R. R.
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(1 Yr.) Charles Orchard, Spl. Agt., Traffic Dept , Carnegie Steel Co.
(1 Yr.) John B. Wright, Asst. to V. P., West. Airbrake Co.
(2 Yrs.) J. S. Lanahan, V. P., Fort Pitt Maleable Iron Co.,

PRESIDENT: It is, of course, well understood that the members have the privilege of nominating others as they may desire. Are there any further nominations?

MR. D. J. REDDING: I move that the report of the Committee be accepted, and the nominations sent out to the membership in the usual course.

The motion was duly seconded and carried.

PRESIDENT: We now come back to the discussion of the paper. We all realize that we cannot at once analyze all that is in the paper. It takes time and study. It took time and study to gather the information contained in the paper in such splendid form. When it appears in print it will be a great subject for study for some time to come. I expect you to join in the discussion voluntarily, as I will not call on any one specifically.

MR. G. W. WILDIN: Mr. President and Gentlemen: I presume what I have to say in discussing the paper of the evening had just as well be said now so that the ball will be started rolling. First, I want to extend my compliments to Mr. Sillcox for his splendid instructive paper, the best exposition of its kind we have ever had presented before this Club. It is so comprehensive and in such detail that it is impossible for any one to discuss it intelligently in its entirety because of the short space of time we have to familiarize ourselves with its contents.

I do not care to discuss the utilization of cars in service, and will leave that phase of the subject to the various operating members of our Club, many of whom I see present.

Two features of the paper rather appeal to me strongly. Having spent about twenty-six years of my life in railway service, principally in the Mechanical Department, their significance impress me. The first of these is the maintenance of a regular and constant minimum force in connection with the maintenance of equipment department. No road in my time ever undertook to maintain a shop force uniformly throughout the year, but varied it as traffic conditions varied. They may have changed in later years, but I doubt if with very much success, as financial influences usually have their bearing on the question. Railroads do not like to spend money when they do not see it coming in. The proper and economical thing to do, not only in railroad work, but all industrial work as well is to fix the amount you can consistently spend in maintenance and upkeep in any given year and then let the officer in charge spend it at a time and in a manner most economical as his best judgment may dictate.

What has usually been done in the past was to make a monthly allowance to the maintenance of equipment department based on assumed traffic conditions, if the business was good the appropriation was liberal, perhaps, but if business was off, appropriations were cut accordingly. This arrangement, as all motive power men know, developed waste. Appropriations were used up entirely whether actually needed or not, through overtime, night work, etc., the feeling being that to have any part of the appropriation unspent would invite a reduction in the following monthly appropriation, whether justified by conditions or not, and it usually followed.

There can be no question I think, but that a minimum regular force working at maximum capacity throughout the year will maintain railway equipment far more economically than a spasmodic varying force based upon business fluctuations. There is another element in this human equation that must be reckoned with, both by railroads and industrial concerns, and that is the limit placed on the proper material with which to build and maintain our working forces, due to our existing immigration laws, and I feel that it behooves everybody to get and maintain a minimum unit force and arrange so as to keep it working steadily throughout the year, not only from the economic standpoint, but from the better citizenship we will foster. We cannot expect to knock employes around from pillar to post and yet keep with us the more efficient and higher type of workmen, the best class of employes are going where they will be reasonably sure of a steady job, whether the pay is the largest or not.

The second point in the paper, which attracts my attention, is the careful details given by the author covering the question of car design. It is hoped that the A. R. A. Committee now working on standard car designs will soon complete their work on all classes of cars and that the resisting members in the construction of all cars will have equal capacity to absorb shocks whether the car be of 60,000 lb., 80,000 lb., 100,000 lb., or any other capacity. In other words the backbone or center sill construction of all classes of cars should be equal in capacity to stand hump yard and other shocks as they all get the same treatment in service. In the past, cars have been designed usually on the basis of a distributed load, consequently the lighter capacity cars were of weaker center construction, the length being the same.

What I have said concerning the center sill construction applies equally strong to other appliances which are subject to the same treatment such as automatic couplers, draft gears, draft gear yokes and attachments, etc. No good engineering reason exists for applying light capacity draft gear, etc., to light capacity cars just because they are such. If there is any car that should have the protection of a good high capacity draft gear it is the weaker type of car as it has no preference in the makeup of a train or in yard switching. Then, if my views as to construction are correct, the higher capacity cars will be the most economical as the ratio of gross to tare weight will be greater.

MR. D. J. REDDING: I want to endorse what Mr. Sillcox said, and also Mr. Wildin, particularly his remarks about working with a continuous force. It would necessarily be a smaller force than we are working with in the peak load period. Many of us have been arguing for that for many years without getting very far. I only know of one railroad that has an annual appropriation for maintenance of equipment. There may be more. As was said here, you will get your appropriation from month to month. I am afraid he was rather betraying secrets when he said you sometimes spend more than you ought to to use up your appropriation for fear you would not get as much the next month. Whether that be true or not, the annual budget for maintenance of equipment or track or any other expense of a railroad seems to be the only real solution. As I understand the situation, the I. C. C. require the submission of monthly statements showing the ratio of expense of operation to earnings. These reports have a very appreciable effect on Wall Street and other places where they distribute the money for railroad operation. If your railroad earnings are reduced for three or four months, and you spend just as much as you do in prosperous months, your ratio of operating expense goes away up in the air, and some one wants to know why you do not cut it. If you cut it, away goes your scheme for uniform maintenance. If some scheme can be devised by the financial representatives, rather than the mechanical, whereby we can start in at the beginning of the year and know how much money we will have for the year, and then arrange to spend it month by month, in accordance with the opportunity to secure material and men, we could regulate our forces and get along with a smaller and more efficient force than under the present system, where we may be called upon to make a radical cut from one month to another, and this system would result in a very much lower cost of maintenance, and I hope we are gradually working toward that end.

On the feature of better freight car movement, I have seen some reports recently which would indicate that over the country at large, there has been an improvement in the movement of freight, and while shippers in some cases have complained about the freight rates, they have evidently failed to take into consideration the reduction in the cost of handling their business, as a result of this better freight car movement. I gathered from the reports I referred to, that in the northwest, the lumber interests are carrying approximately six million dollars less stock than they were a few years ago, although doing a larger business. This, as a result of getting prompt movement for their lumber, and making quicker deliveries, so that they are not obliged to carry so large a stock on hand, to cover the time lost formerly in shipping.

In the wholesale merchandise business, it is said that there is much less money invested in stocks than formerly, due to the ability of the merchants to secure quicker deliveries, both on stocks ordered and on shipments to retailers. Several of the large automobile manufacturers have reported that their inventories are very much lower than formerly, although they are doing a larger business, as they do not find it necessary to carry so large a stock of repair parts on hand for shipment to their representatives throughout the country, owing to the ability to reach those customers in much less time; neither do the retailers carry stocks equivalent to those formerly carried on account of this quicker delivery, from all of which it would appear that there must be a tremendous saving in interest charges on these various stocks resulting from the better movement of freight throughout the country.

MR. P. H. GODA: I have listened to this paper with a great deal of interest and I think Mr. Sillcox has given us a very thorough study of the subject. There are a number of points, which I think he sums up in the last paragraph of his paper, that I might make a few remarks about. He says the greatest utilization of the industrial car is to be obtained by having the best design. I think that is a very important point. I believe we ought to look back to the development of the freight car, especially what the A. R. A. has done toward making the design of the car better and making it cheaper to maintain. For instance, there was at one time over a hundred different kinds of couplers used. Today we have but one coupler, the A. R. A. standard. We have standard axles and standard wheels, we have standard methods of turning wheels and standard guages, we have standard journal boxes. These standards all help to bring down the cost of maintenance of cars. I think a good many of us are accustomed to think of a freight car as a lowly sort of conveyance, which it probably is, compared to an automobile, but if some of us realized the enormous cost of maintaining a freight car we would see that the question of design and maintenance has a great deal to do with keeping down the cost.

With regard to design, the efforts have been to increase the car mileage per day. That has been increased since the war period to something over thirty miles per day. Shippers should be interested especially in knowing that this has been done because the more miles the car is hauled a day the quicker it gets to its destination. There, again, the matter of design has to do with the number of miles the car moves a day. We have standard designs on various railroads and if we have standard parts at the various terminals these cars can be repaired quicker and it means less delay in the movement of the car. The utilization of standard shapes in the repairs of steel cars, such as pressed steel shapes and angles greatly facilitate repairs and are much more convenient to carry in stock than odd designs of castings.

I believe the point that interested me most in this paper was the one of increasing the capacity per unit. That means shorter trains, it means faster movement. Another interesting point he brings out is the question of the most economical standard for current meaintenance. I believe the tendency within the last few years has been to come to a method of repairing cars by the progressive system and rebuilding cars as units. Some people would call this the Ford plan, which I believe is a pretty good name for it. Steel cars can be dismantled and rebuilt in very much shorter time than the haphazard way we used to repair cars where they were sent to the repair tracks and one man or two men worked on the entire car. With this new system of rebuilding cars the work is done by gangs of special men in a progressive way with all modern facilities thus increasing production and decreasing cost of rebuilding.

The matter of distribution so the cars can be hauled with the least possible number of units, that together with the designing and the decreased cost of maintenance will bring down the cost of repairs, which certainly is enormous at the present time. From the old light construction of wooden cars, we have come down to a standard design, the A. R. A. standard box car, of which there are 25,000 in service today. This is a step in the direction of lower maintenance cost.

COL. JAS. MILLIKEN: Before I say anything about this paper I would like to express my appreciation to the Nominating Committee for the honor they do me in putting me on the Membership Committee. That may be due somewhat to the large number of new members I have recommended during the past year. I will just say that I hope the choice of the Nominating Committee will be confirmed at the election.

I have often wondered why a man as young as Mr. Sillcox should be General Superintendent of Motive Power of so great a railroad as the Milwaukee. But after hearing his paper I am not so much surprised. It just goes to show that brains do count. There are one or two things in the paper that appeal to me very much. The first is the comparative cost of maintenance as compared with the degree of maintenance. Where the freight car equipment is maintained within 5 per cent the cost is $151.00 per year per car. But where a railroad allowed its maintenance of cars to drop off as low as 15 per cent in bad order the cost per car is $187.00. I have no doubt that the railroads that show only 5 per cent bad order cars are the ones that have a budget system. I agree with the paper and with Mr. Wildin that the budget system in maintenance of equipment on railroads is the ideal system. It means continual service of car repair employes and that means efficiency.

PRESIDENT STUCKI: There are a great many shippers in the room. Did you overlook the recommendation for cutting down the number of sidings to improve the movement of the freight car? There is some food for thought.

MR. F. H. STARK: I do not represent the transportation department. However, I want to second what a number of the gentlemen have said regarding the paper of the evening. It appeals to me as one of the most practical papers we have ever had on the car maintenance situation. It comes from a man who is intimate with the subject, not only of the construction and maintenance of cars, but also of the transportation problem, and the greatest obstacle he will have will be the difficulty of convincing the managers that his policy is the best. It will take some missionary work.

I have followed the author through the railroad papers and through friends, and he is recognized all over the country as one of the leading men in his line. I had the pleasure of reading his catechism prepared for the car inspectors. Having served as a car inspector once myself I know what it means. The mechanical departments constantly send out instructions to inspectors from Bulletin No. 1 up to 100, to such an extent that they can not be absorbed. Well, he files them in order and they are, of course, all covered up. In this book of instructions it anticipates pretty nearly every difficulty with which an ordinary inspector is confronted and by reference to this book he is instructed what to do. It is one of the most complete I ever saw in print.

With reference to this paper, it would be impossible for any ordinary fellow to make any criticism. It is clear and practical. I wish, however, that the managements of the railroads would realize that among the economies, largely standardization of parts, a great many railroads in years past were obliged to buy cars according to their finances and they purchased cars of less weight and not so good design because they wanted to purchase a large number of cars. I do not believe that prevails today as much as in the past, and if standard parts were required in the construction of cars it would do away with a great deal of difficulty and expense and delay. For instance, center sills should be of a certain section regardless of the capacity of the car, and in that way it would strengthen the car. On the other hand, if the railroads would consider that cars that cost $1,500 should be handled in the same manner as a locomotive or coach. In some yards of which I am acquainted, they have reduced damage to freight cars to pretty nearly a minimum since the war, through the efforts of the transportation department. This is a very interesting subject and we are glad Mr. Sillcox favored us in so able a manner.

PRESIDENT STUCKI: I said I would not call on any one individually. There is one gentleman on whom I would like to call, but he has a very bad cold and can hardly speak aloud. Maybe he will say something anyway.

PROFESSOR L. E. ENDSLEY: During the reading of the paper the thought came to me that thet mechanical problem with which most of you men here are connected is not one by itself. It is a very little spot on the whole railroad map. It is part of a big thing in which all these factors, which Mr. Sillcox has mentioned are also a part. And they should be studied from the broad standpoint. The problem of railroading today is the hauling of freight at the minimum cost, and that can only be done by every department, designing, operating, maintenance, all working together. And the budget system is the only way any business can be successfully run, and why not apply it to the railroads. I have often wondered about that.

MR. FRANK G. MINNICK: I listened very attentively to Mr. Sillcox's paper and I want to say that from some limited experience on our own railroad we know that his theories are sound. But there is also something to be said in connection with the criticism of the last speaker. Why do the railroads not give more consideration to doing their work by the budget system? I think a great many of them do, but there are other causes that lead to expensive railroad operation, which I am afraid my good friend has overlooked. I want to speak about the P. & L. E., because that is the only road I know anything about, and not very much about that. We have a very considerable number of locomotives that have not earned a dollar in three years. We have thousands of freight cars in exactly the same condition. Those locomotives and freight cars are in 100% physical condition. One year we needed them and the next three or four years we did not. There is an enormous investment lying idle and you can theorize until the cows come home, but until you can keep your equipment busy, main tracks reasonably well occupied, and yards and terminals occupied, you are not going to get a very economical operating cost. And my thought is that the whole thing goes back to the American public as a whole. We do not do anything for two or three years and then we try to catch up by doing two or three years' work in one, which makes for a most expensive program and a very high living cost.

I simply mention that because I have felt in the past and I feel tonight that there are a great many people in the country who do not realize the burdens that are placed upon the railroads through no fault of their own. In 1920 we found ourselves in a bad labor situation following the great war. We had two lean years, 1921 and the larger part of 1922. The system of which the railroad I am with is a part, bought hundreds and hundreds of locomotives and thousands and thousands of freight and passenger cars, without any more real knowledge as to whether they would ever need them than anything in the world. Nobody knew. The following year, 1923, everything we had was busy. And I want to say that on the New York Central Lines, and I understand it was true on the other larger lines, they went through the entire year without a single car shortage of any description; further, they moved more gross ton miles than they ever moved before. In 1924 and 1925 to date, 40 per cent at least, if not a little more, of all the equipment owned by the larger systems in the country has been standing idle and then only after money has been spent in large quantities to put them in first class condition in the expectation of a business revival. It seems to me that if we are going to demand of the railroads economical or low cost transportation, if we are going to demand of the railroads that they do their business on a budget system, we should ask the American public that they apportion their business on yearly periods. And then we will show you that if the railroads can keep their earnings somewhere within a fair average year in and year out, you will find your operating or your transportation costs very materially lessened. I do not believe there is any line of business that is being studied any more closely for economic cost than the transportation problem today. I do not believe there is a line of business that is any more under fire than the railroads today. And I do not believe the fault lies primarily with the railroads. We are not blameless. We make mistakes. But I believe the real salvation for the railroads is coming from the public through the medium of an equalization of business throughout the year.

COL. JAS. MILLIKEN: I just want to say to Mr. Minnick that he is wrong. The reason he is wrong is that he is not taking a credit that is due the P. & L. E. and to the railroads of the country. He says they have a lot of locomotives and cars out of service—and yet the railroads are doing the biggest business they ever did in their lives, in the history of the country. There have been more cars moving over the entire country in the last four weeks than in any other four weeks of history. There are more locomotives stored, there are a greater number of cars stored in good order than there has ever been with the amount of business on hand, and it is all due to the fact that the railroads have been working more efficiently.

MR. MINNICK: I do not want to get into a long discussion, but I just want to say that my good friend is mistaken. On the P. & L. E., and I refer to that because I know a little about it, we have this unfortunate condition. What you say with regard to the railroads generally is true. But it does not apply to the facts on the P. & L. E., for this reason: In our general business we are doing a better business than we ever did. But in our coal and coke and iron ore in 1924 and 1925, it has been most deficient. On the other hand, down in Kentucky, West Virginia and Virginia there are railroads that had to do what we did three or four years ago, buy cars and engines galore to catch up with a very heavy coal and coke movement, due to the fact that in certain territory the miners are not organized and the scale paid to miners is somewhat lower than in this territory, and the freight rate is somewhat less. The result is that they are working overtime and we are idle. That has resulted in some railroads not having their volume and others having more volume than ordinarily. On top of that we have the motor truck competition, which cuts deep into our short haul carload stuff. These are factors that should be considered in dealing with this question, and having our business handled uniformly year by year rather than in spots. The remedy is not with the railroads and it is not with any individual, but there is an economic factor that should be recognized. Speaking of the P. & L. E., we did not have normal business in 1924 by about 41 or 42 per cent and we have not had it so far in 1925 by about the same percentage, that we had in 1922 when we moved the greatest gross and net earnings in the history of the road, even during the war period.

MR. J. R. GEDDES: We understand the St. Paul are getting some fifty foot mill type gondola cars. What use are they going to make of them and what brought about the design of these cars?

MR. SILLCOX: We are, at this time receiving 500-501 mill type gondolas for pipe loading in the Wyoming and Montana field and we expect to carry coal, coke, poles and other lumber products in them. They have doors in the sides, but primarily our particular type of car was designed to carry pipe. This type of equipment has also been considered desirable by other western administrations.

MR. L. S. STEWART: I have been very much interested in the paper. However, not being a car man, I do not think it went far enough in the design of the car. On the road that I work for, a number of years ago we had a car that was designed to be unloaded on the dock at Ashtabula. It was like pulling teeth when you were called out at four o'clock in the cold morning to go down into the yard when it was almost impossible for a locomotive to move these cars. But we got away from that kind of cars and got into a better class of cars, that is, into coke cars that had ball bearing center and ball bearing side bearings. They hauled very well. They outlived their usefulness and we have now the 70-ton car. With the 70-ton cars we are now able to haul 7,000 tons 118 miles in 6 or 7 hours with our new locomotives. We have 16,000 gallon tanks and go 85 miles without a stop. By having this kind of car we speed up the movement of trains, keep the yards from being congested, and by not making a stop in 65 miles, we leave McKees Rocks and our next stop is Youngstown, provided we do not have to lay over at the end of the four tracks for passenger trains. We have cars coming from the C. P. R. for the West Virginia coal fields. These are 50-ton cars, and are hauling 80 loads from there and these do not haul nearly as well as the 70-ton hoppers. We get 7,000 tons of ore in about 70 cars and where the old type of locomotive dragged on the curves, with our new type of locomotive and our new type of cars it is at the present time a pleasure to go out and make the trip.

PRESIDENT STUCKI: Mr. Gilg, do not go out the door until we hear what you have to say.

MR. HENRY F. GILG: It is so long since I railroaded that I do not know anything about the present type of equipment, it being quite different from what it was some forty years ago. But all things are relative. One of the questions that was brought up in my mind by the remarks of Mr. Wildin and Mr. Stark is in regard to the sills being made stronger in the lighter type of car. When I was despatching, we had quite a number of four-wheel hoppers, which held five or six tons. We had some 8 and 10-ton cars, and then the standard car had gone on to 12 tons, and then a jump was made to 20 tons. It could not be foreseen what the capacities of the cars would be a few years hence. Those 20-ton cars did not have the strength of sills of a 50-ton car today. You are going to 70-ton cars now and nobody knows whether you are going to 100-ton or 150-ton cars. Are you going to make sills strong enough for what is coming in the future? And can any one tell what that will be? That is one of the problems you get by anticipation. How that can be figured is something I do not know. I had cars buckle up when the twenty-ton cars came in because I had to make up my trains from all the cars from different roads and there were not such standards in that day as there are now. The thing I would like to know is how you are going to make the sills strong enough for the heavy cars that are coming, when you do not know how heavy they will be. It is simply a matter of destruction or replacement, it seems to me. You can not avoid having cars of all kinds. There are a lot of cars from the Canadian roads, and you will always have them, and I don't see how you will overcome it.

PRESIDENT STUCKI: The time is growing late and we have the usual lunch waiting for us in the rear of the room, hence I will ask Mr. Sillcox to close the discussion by adding anything he wishes to say in answer to any of the points that have been raised.

MR. SILLCOX: In regard to Mr. Gilg's question in regard to the planning for the future. The policy in design of car equipment today is to have the coupler fail first, then the draft gear, and then the lugs and sills. We have got to control the speed of car equipment if we are going to avoid destruction. I think four miles an hour is an average reasonable switching speed. My judgment is that we are going to be confronted with the problem, unless the design of draft gears is considerably improved, of taking them down for complete examination and repairs every three years. On the railroad with which I am connected, we are taking down about 28,000 gears right at this moment to find out what is occurring. Our information indicates already that some of these gears, which have not been in service two years, are failing. We know they have not offered as much protection as desired, because the couplers show signs of striking the buffer block. If they continue to strike in this manner, the couplers will finally give way and ultimately the draft will break down leaving the car without the needed shock absorbing medium it requires. From this it would appear that before we can consistently subscribe to a plan calling for heavier sill construction than at present prescribed by the A. R. A., it seems to me we have got to refine our maintenance. I do not think, so far as can now be judged, we can afford to carry center sills under cars having a cross sectional area greater than 30″.

The next question, which was discussed most freely, was this matter of steady employment. I did not intend to tell you some inside experience on this, but I guess I have got to. A year and a half ago our men came in and wanted 8c an hour more pay. We are not a rich railroad. We have since gone into the hands of receivers. The management advised that it was not possible to give any advances in rates of pay because it was out of the question to do so under the circumstances. It was a difficult matter to know just what to do. Finally it occurred to us that if we worked a minimum number of men steady throughout the year, it would mean an increase in earning per man hour of 6c. It was then necessary to go back through the records for fifteen years in order to establish what the least basic force would be and yet protect the operation. The features under consideration were finally developed in detail and an arbitrary reduction was made on the sum total in order to be sure and not risk any over expenditure in the event the business outlook were to take a bad turn. As you know, we have a very varying and seasonal traffic in the west. A large proportion of all the traffic is in the movement of grain and live stock at this time of the year and the remainder of the time it runs in much less volume than in the fall. A fairly good force is always required to combat the winter snow, cold and severe elements. Much of the heavy work had to be scattered around in order to maintain a steady force in the territory where forces had to be arbitrarily stationed. We have been able, by co-operation, to have the best kind of work done economically even in the face of most trying circumstances and lack of facilities because we have got a set of satisfied and thoroughly competent men. The principle of steady employment is right, and wherever there is a lack of it, labor trouble is most frequent regardless of the rate of pay per hour. I do think we can do more toward steady employment than we have done in the past if we look at it as seriously as the matter deserves. The minimum allotment always or even necessarily take care of our peak periods or anything out of the ordinary and, in such times, when we put extra men on over and above the minimum allotment, we tell those men that the job to which they are assigned is good for thirty days, or more, so that if they can find a better job anywhere else it is possible for them to become located. We work from month to month with these temporary men in that way. In this way the temporary men are not in any uncertainty as to what the future holds. On the other hand, the men that represent the minimum force know that as long as the railroad runs they will be kept steadily at work in so far as it is at all possible. I think the most damaging thing, at least I have found it so with our men, it is hard to tell them you are trying to be efficient and ask them in turn to be efficient when they see you working overtime one month and half time the next. The principle of this matter of steady employment is right and each one of you will know how far you can helpfully go within your own operation. As long as the principle of the thing is right we ought to aim for it and come as close to it as we can. I am very much interested in what Mr. Minnick says and it is true. But if for the time being we just limit ourselves to the minimum force and tell these men they will have steady work, I think that is the best step we can take just now.

MR. REDDING: I think we have all been very much interested and instructed by the paper of the evening. There is too much of it for any one to hear and then talk intelligently about very much of it. It will do us a great deal more good when we get the printed proceedings. I believe the speaker is entitled to a formal vote of thanks in expression of our appreciation and I therefore make such a motion.

MR. CHARLES ORCHARD: Before that vote is put I would like to take up the challenge given to the shippers. I represent at least one large shipping company and am much interested in what the speaker says about the average load. Coal and Ore are classified in his paper as the heaviest loading commodities, then Manufactured Articles in general with a low average of less than 50,000 pounds per car; the highest average of Manufactured Articles being Pig Iron with average load of approximately 82,000 pounds per car, which figures no doubt are taken from statements representing the average loading of the entire country.

It is true that the railroads have been moving record tonnage; but with all respect to the efficiency of the railroads I think their good work is due, to some extent, to the heavier loading by shippers.

I happen to have some figures of our own Company (Carnegie Steel Company) which cover the average loading of all commodities shipped by us, including some Pig Iron and a great deal of materials such as long Structural Shapes, Plates and Bars, where the load is limited by A. R. A. Rules, on account of the length of material, to 50 to 75 per cent of the capacity of the car. Including such material with our other Steel Products, our average load in 1923 was nearly 98,000 pounds per car, as against 82,000 pounds which the speaker gives for Pig Iron. Through our intensive campaign for heavier loading, which has extended over a number of years, our shippers have increased our average load from 79,834 pounds in 1913 to over 98,000 pounds in 1924. Of course, this is due, to some extent, to the larger capacity of the cars used and also to the heavier loads permitted under the Axle Capacity Rule, but it does show that the railroads' record for efficiency in transportation is due, in some considerable measure, to the heavier loading of cars by shippers.

I want to say right here that I think the railroads are lax in not making shippers more familiar with the increased loading possible under their Axle Capacity Rule, under which Rule, as you know, the car may be loaded to a weight based on the difference between an arbitrary gross weight (car and lading) fixed for a car equipped with standard size axles, and the weight of the empty car.

A great many shippers do not know yet that they may load beyond 10 per cent over marked capacity, and other shippers have had to dig out the thing for themselves. For example, a 100,000-pound capacity car with a plus 10 per cent load gives a 110,000-

pound revenue load, whereas under the Axle Capacity Rule the same car may be loaded to about 129,000 pounds net (169,000 pounds limit minus 40,000 pounds light weight", or an increase of about 17 per cent. Again, some roads limit the weight of the load in cars handled over their line to not exceed 10 per cent above the marked capacity of the car, while other roads will accept the same car loaded to its axle capacity limit.

It is puzzling to the shipper to know what to do where a shipment is to travel over two or more roads whose load limits do not agree. Where a short-haul initial line or a switching line limits its load to marked capacity plus 10 per cent and its long-haul connections can handle cars loaded to the axle capacity limit, the latter roads are deprived of revenue tonnage which shippers could have given them if not restricted by the limits of the initial line.

If the railroad would devise some more effective plan to acquaint shippers in general with what is now permissible in the way of maximum loading of cars and could all agree as to handling cars loaded up to the axle capacity limit, it would be better for the railroads and for the shippers and would effect a transportation economy.

MR. MINNICK: Mr. Orchard has seen fit to pass the buck back to the railroads and I want to take a fall out of him. I believe Mr. Sillcox stated that the figures he got on average loading were from government statistics and were accurate. I want to say that the trouble with the railroads in getting big loadings from the large industries is not particularly difficult. Further, I realize that there is some difference with respect to information that the public does not have as to what they can do. That subject has been given a great deal of thought by the railroads generally. One method would be to stencil on the car the actual carrying capacity, however we find there is some danger in that in dealing with the smaller shipper. I want to say, Mr. Orchard, if you could see the effort that is made on the part of the railroads to acquaint shippers with what they can do, and if you could see the reception we receive when we go to them and point out where they have failed to load cars to their full capacity and give them actual photographs of the lading itself, you would have a somewhat different view of the activities of the railroads in endeavoring to obtain a full loading of cars. We follow that very closely and we do not have to go to the Carnegie Steel Company or Jones &

Laughlin or the National Tube Company, or people like that, because they have men that study it and know what they can do. But many smaller concerns who can not afford that organization, rather resent the railroad trying to acquaint them with it. We have been working at it since 1917 and have made a lot of progress, but there is a long way yet to go. It is not going by default. We are trying every day.

PRESIDENT STUCKI: The motion to extend a rising vote of thanks to the speaker of the evening will now be put.

The motion prevailed by unanimous vote. There being no further business, upon motion, adjourned.

J. D. CONWAY, *Secretary.*

June 24, 1925.

Mr. A. P. Schrader, Manager, Steam Railroad Section, Transportation Division, Westinghouse Electric & Manufacturing Company, Chamber of Commerce Bldg., Pittsburgh, Pa.

Dear Mr. Schrader:

In behalf of The Railway Club of Pittsburgh this letter is sent at this time, although a little tardy, in recognition of the very splendid program and entertainment presented by your company on April 30, 1925.

The President of our club and the writer, both being away, may in part explain the delay in expressing our thanks and appreciation. Those who were privileged to be there I am told enjoyed the affair very much. I might add, while it is a little late to express through our Official Proceedings these thanks, nevertheless, we shall do so at our next meeting which will be in September.

Kindly convey our thanks to the members of your Company who aided in the program.

Yours very truly,

J. D. CONWAY,
Secretary.

JDC/L

In Memoriam

HARRY B. PIERCE
Died June 6th, 1925

HOWARD L. BEACH
Died June 20th, 1925

EDWARD W. NEWELL
Died June 28th, 1925

INDEX OF PAPERS AND THEIR AUTHORS

PRESENTED BEFORE RAILWAY CLUBS DURING THE SEASON OF 1924-1925

Compiled by

THE SOCIETY OF RAILWAY CLUB SECRETARIES

NEW YORK RAILWAY CLUB

Harry D. Vought, Secretary, Room 314, 26 Cortlandt St.
New York City

September, 1924—"The Articulated Car." By *W. G. Gove, Superintendent of Equipment, B-M. R. T. Corp. Discussion by W. B. Potter, Chief Engineer, Railway Dept., General Electric Co.*

December, 1924—Sixth Annual Dinner, Hotel Commodore. Addresses by *Dr. David Friday, Robert A. Burlen and President W. F. Jones.*

January, 1925—"New Era for Steam Locomotives." By *John E. Muhlfeld, Consulting Engineer, New York, N. Y. Discussion by James T. Partington, Manager, Engineering Dept., American Locomotive Co.; W. L. Bean, Mechanical Manager, N. Y. N. H. & H. R. R.; W. H. Winterrowd, Assistant to President, Lima Locomotive Works; C. B. Peck, Mechanical Department Editor, Railway Age; C. A. Seley, Consulting Engineer, Locomotive Firebox Co.*

February, 1925—"Personnel Administration." By *Dr. Henry C. Metcalf, Director Bureau of Personnel Administration, New York, N. Y. Discussion by Hayes Robinson, B. & M. R. R.; Capt. O. S Beyer, Jr., Consulting Engineer, Railway Employes Dept., American Federation of Labor; John A. Droege, Acting G. M., N. Y. N. H. & H. R. R.; R. J. Shannon, Supervisor of Men and Handling of Work, West Albany (N. Y.) Y. M. C. A.; H. A. Gillis, M. E., Washington, D. C.; Harrington Emerson, Efficiency Counsellor, New York, N. Y.*

March, 1925—"Railroad Motive Power." By *W. B. Potter, Chief Engineer, Railway Department, General Electric Co.* "Radio on Railways and Elsewhere." By *G. Y. Allen, Westinghouse E. & M. Co.* "What the Club is Doing for Members." By *H. H. Vreeland, Chairman, Executive Committee, New York Railroad Club Elisha Lee, Vice-President, Pennsylvania Railroad System; Daniel M. Brady, President, Brady Brass Company.*

April, 1925—"The Transportation Problem." By *Dr. Winthrop M. Daniels; Thomas De Witt Cuyler, Professor of Transportation, Yale University; Samuel O. Dunn, Editor, Railway Age; Walter H. Flynn, S. M. P., N. Y. C. R. R.; Harrington Emerson, Efficiency Counsellor Daniel M. Brady, President, Brady Brass Co.; H. L. Des Anges, Supt., Marine Dept., L. I. R. R. Concert by B. & O. Glee Club.*

May, 1925—"Lubricating a Railroad Organization." By *R. E. Woodruff, Supt., Erie R. R., Buffalo. Discussion by Dexter C. Buell, Director, Railway Educational Bureau, Omaha. Concert by the Shop Force Glee Club of the Pennsylvania System.*

CENTRAL RAILWAY CLUB OF BUFFALO

Harry D. Vought, Secretary-Treasurer, Room 314,
26 Cortlandt St., New York City

September, 1924—"The Smooth Handling of Passenger Trains." By *E. R. Boa, R. F. E., N. Y. C. R. R.*

October, 1924—"The Three Atoms." By *W. L. Robinson, Supt. Locomotive and Fuel Performance, B. & O. R. R.*

November, 1924—"Possibilities of Railway Clubs." By *Roy V. Wright, Managing Editor, Railway Age.*

December, 1924—"Terminal Operation." By *R. L. Scott, Trainmaster, N. Y. C. R. R.*

January, 1925—Annual Meeting and Dinner. *Charles C. Castle, Toastmaster and the Rev. Dr. R. J. McAlpine of Buffalo, Chief Speaker, his subject being,* "Playing the Game."

February, 1925—"Locomotive Feedwater Heating." By *L. G. Plant, Assistant to the President, National Boiler Washing Co.; W. A. Buckbee, Traveling Engineer, and H. B. Oatley, Vice President, Superheater Co.*; *T. C. McBride, Worthington Pump & Machinery Corp.*

March, 1925—"Freight Car Demurrage." By *J. F. Chalfant, Manager, Department of Demurrage Supervision, A. R. A.*

April, 1925—"Milling in Transit and Reconsignment." By *W. B. Errington, Agent, Nickel Plate R. R., Buffalo.*

May, 1925—"The Locomotive Booster." By *J. A. Talty, Special Engineer, Franklin Railway Supply Co. Concert by the Buffalo, Rochester & Pittsburgh Glee Club.*

WESTERN RAILWAY CLUB

Bruce V. Crandall, Secretary, Box 2,
189 W. Madison St., Chicago, Ill.

September, 1924—Address by *Dr. Donald D. Conn, Car Service Division, A. R. A.*

October, 1924—"The Railroad Situation of Today." By *Samuel O. Dunn, Editor, Railway Age.*

November, 1924—"The Business of Moving Trains at a Profit." By *W. E. Thiehoff, G. M., C. B. & Q. R. R.*; *E. F. Hall, S. M. P., C. & N. W. Ry.*

December, 1924—"Regulation and the Future of Railroads." By *H. G. Taylor, Chairman, Nebraska State Railway Commission.*

January, 1925—"Is a Railroad Code of Ethics Possible?" By *R. S. Parsons, Vice-President, Erie R. R.*

February, 1925—"What is the Railway Supply Industry?" By *Samuel O. Dunn, Editor, Railway Age.* "The Supply Man is Entitled to a Place in the Hall of Fame." By *Bruce V. Crandall, Editor, Northwestern System Railway Magazine.*

March, 1925—"Training of Apprentices." By *G. G. Juneau, M. C. B., C. M. & St. P. Ry.*

April, 1925—"Importance of the Railroads and the Duties and Responsibilities of the Mechanical Organization." By *A. G. Pack, Chief Inspector, Bureau of Locomotive Inspection, I. C. C.*

May, 1925—Annual Dinner.

NEW ENGLAND RAILROAD CLUB

Wm. E. Cade, Jr., Secretary, 683 Atlantic Avenue, Boston, Mass.

October, 1924—"Selling Transportation." By *Gerritt Fort, Vice-President, B. & M. R. R.*

November, 1924—"Safety Work on the Interstate Commerce Commission." By *A. G. Pack, Chief Inspector, Bureau of Locomotive Inspection, I. C. C.*

December, 1924—"Ancient Trails and Modern Highways." By *W. B. Lanigan, General Freight Trafic Manager, Canadian Pacific Railway.*

January, 1925—"Preservation of Forest Products." By *Hermann Von Schrenk, Consulting Timber Engineer, N. Y. C. R. R.*

February, 1925—"Methods of Analyzing Shop Output and Costs." By *J. E. Slater, Special Assistant to General Manager, N. Y. N. H. & H. R. R.*

March, 1925—"Forty-Second Annual Meeting, Election of Officers and Reports, together with Address by *Judge Redmond, General Counsel of the Central Vermont R. R.*

April, 1925—"Stores Department, The Pennsylvania Railroad System." By *C. D. Young, Stores Manager, Pennsylvania System.*

May, 1925—Annual Banquet and Entertainment.

ST. LOUIS RAILWAY CLUB

B. W. Frauenthal, Secretary-Treasurer, Drawer 24,

M. P. O., St. Louis, Mo.

May, 1924—"Our Railroads—Their Rates as Affected by Consolidation, Taxation and Federal Control." By *W. A. Colston, Vice-President and General Counsel, N. Y. C. & St. L. R. R.*

June, 1924—"Improvement of Efficiency on Terminals." By *Charles Burlingame, Superintendent Terminal Railroad Association of St. Louis.*

July, 1924—"Service Engineers." By *L. F. Wilson, Vice-President, The Bird-Archer Co., Chicago, Ill.*

August, 1924—"A Splendid Agency for Public Service." By *the Hon. Jonathan Bourne, Jr.*

September, 1924—"The Railroads of Manchuria." By *B. B. Milner, Mechanical Engineer, M. K. & Texas R. R., Parsons, Kansas.*

October, 1924—"Locomotive Feed Water Heating." By *J. M. Lammedee, Worthington Pump and Machinery Corp.*

November, 1924—"The Development of the Modern Steam Locomotive." By *J. G. Blunt, Chief Mechanical Engineer, American Locomotive Co.*

December, 1924—"History of the Development of Transportation." By *F. G. Jonah, Chief Engineer, St. L. & S. F. Ry., St. Louis, Mo.*

January, 1925—"Possibilities of Railway Electrification in Missouri." By *Harry Rubey, Professor of Railway Engineering, University of Missouri.*

March, 1925—"The Locomotive Booster." By *T. P. Whelan, Special Engineer, Franklin Railway Supply Co.*

February, 1925—"Oxygen the Wonder Worker." By *G. E. Harcke, Industrial Engineering Dept., Air Reduction Sales Co.*

April, 1925—"University Training for Business." By *Dr. Isidor Loeb, Dean of Business and Public Administration, University of Missouri.*

THE RAILWAY CLUB OF PITTSBURGH

John D. Conway, Secretary, 515 Grandview Ave., Pittsburgh, Pa.

September, 1924—"Some Interesting Problems in Train Operation." By *Prof. Louis E. Endsley, Consulting Engineer, Pittsburgh, Pa.*

October, 1924—Annual Meeting, Election of Officers and Entertainment.

November, 1924—"Locomotives." By *Grafton Greenough, Vice-President, The Baldwin Locomotive Works.*

December, 1924—"The Popularization of Radio." By *J. C. McQuiston, Manager, Publicity Dept., Westinghouse E. & M. Co., East Pittsburgh, Pa.*

January, 1925—"Some Street Railway Transportation Problems." By *Thomas Fitzgerald, General Manager, Pittsburgh Railways Co.*

February. 1925—"Some Notes on Australia." By *C. Baghurst, Inspecting Officer for the South Australian Railways.*

March, 1925—"Aerial Transportation." By *Lieut. C. T. Durgin, U. S. N., Naval Aircraft Factory, U. S. Navy Yard, Philadelphia.*

April, 1925—"The Use of Statistics in Railway Management." By *J. E. Slater, Special Assistant to G. M., N. Y. N. H. & H. R. R., New Haven, Conn.*

May, 1925—"The Story of Power." By *P. Nicholls, Fuel Engineer, United States Bureau of Mines, Pittsburgh.*

CANADIAN RAILWAY CLUB

C. R. Crook, Secretary, 129 Charron St., Montreal, Que.

September, 1924—"Modern Aids to Navigation." By *J. O. G. Cann.*

October, 1924—"Mechanical Refrigeration and Its Application." By *C. H. Kane, Refrigerator Engineer, Swift & Co.*

November, 1924—"The Yardmaster—His Duties and Problems." By *T. Collins, Supt. of Terminals, Canadian Pacific Railway.*

December, 1924—"Railway Location." By *C. S. Gzowski, Chief Engineer of Construction, Canadian National Rys.*

January, 1925—"Electrification—A Factor in the Development of the Railroad Industry." By *A. J. Manson, Manager, Heavy Traction Division, Railway Dept., Westinghouse E. & M. Co.*

February, 1925—"Foundation Brake Design, Installation and Maintenance." By *W. H. Clegg, Chief Inspector, Air Brakes & Car Heating Equipment, Canadian National Rys.*

March, 1925—"Railway Metals From the Inside." By *H. J. Roast, F. C. S., F. C. I. C., Professor of Metallography, Department of Metallurgy, McGill University.*

April, 1925—Address by *E. W. Beatty, President, Canadian Pacific Ry.* "Steam Pipe and Smoke Box Arrangement on Some Modern Locomotives." By *W. H. Winterrowd, Assistant to President, dent, Lima Locomotive Works.*

May, 1925—Annual Meeting.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB

A. T. Miller, Secretary, 120 E. Hunter St., Atlanta, Ga.

September, 1924—"Process and Principles Involved in the Manufacture of Locomotive Tires, Forgings and Rolled Steel Wheels." By *Lawford H. Fry, Mettallurgical Engineer, Standard Steel Works Co.*

November, 1924—"The Three Cylinder Locomotive." By *James T. Partington, Manager, Engineering Department, American Locomotive Co.*

January, 1925—"Welding." By *T. F. Barton, General Master Mechanic, C. & O. Ry.*

March, 1925—"Manufacture of Steel," with motion pictures. By *George A. Richardson, Manager, Technical Publicity Dept., Bethlehem Steel Co.*

May, 1925—"The Development of the Self-Propelled Passenger Motor Cars." By *C. J. McPherson, Manager, Automotive Car Division, J. G. Brill Co.*

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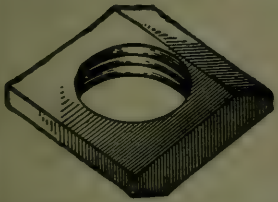

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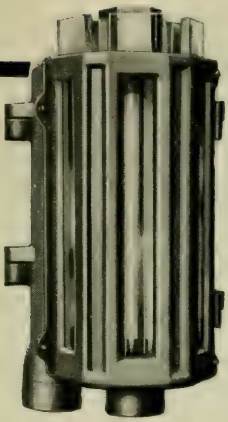

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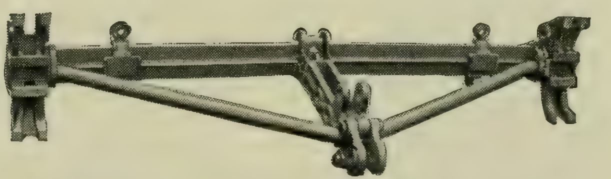

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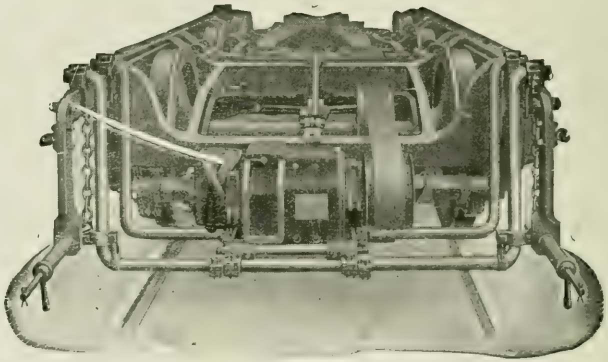

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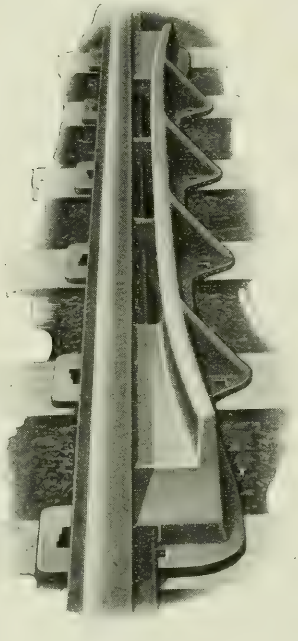

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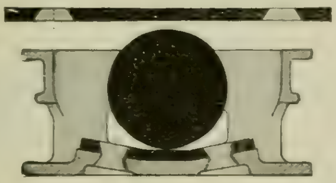

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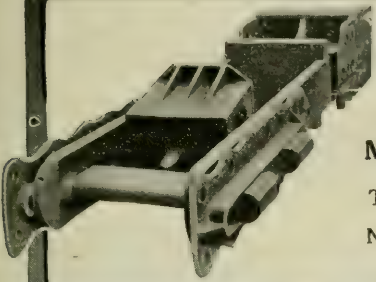

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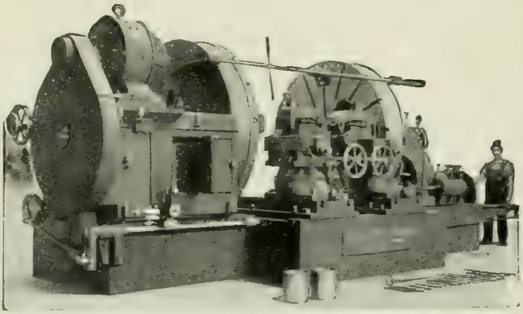

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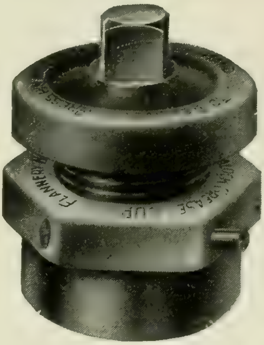

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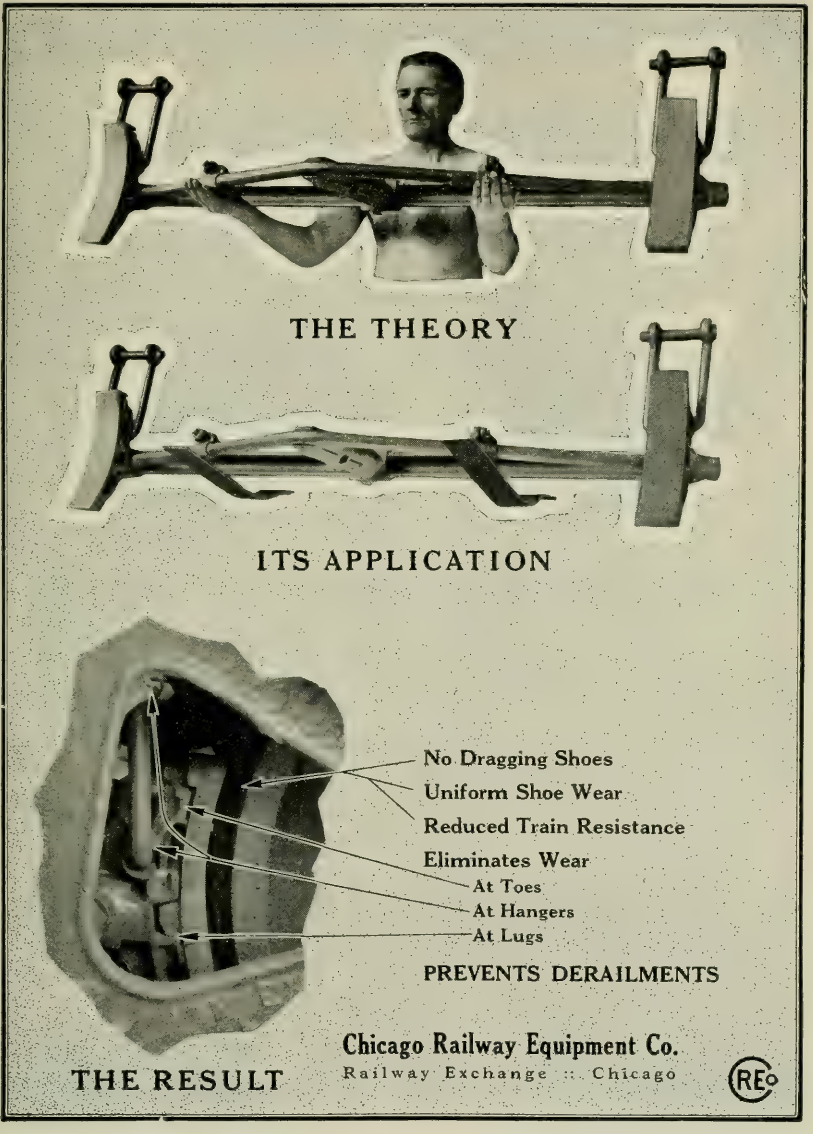
INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	viii
American Brake Shoe & Foundry Co.	iii
American Locomotive Co.	vi
American Steel Foundries	xvii
Baldwin Locomotive Works	viii
Ball Chemical Co.	v
The Bradford Corporation	ix
Brady Brass Co.	Front Cover
Chicago Railway Equip. Co.	xiii
Davis Brake Beam Co.	i
Dearborn Chemical Co.	iv
Flannery Bolt Co.	x
Fort Pitt Malleable Iron Co.	xi
Galena-Signal Oil Co.	xi
The Gould Coupler Co.	ii
Graham Bolt & Nut Co.	Front Cover
Grip Nut Company	xix
Hagan, George J. Co.	Front Cover
Hunt-Spiller Mfg. Corporation	x
Johns-Manville, Inc.	xvi
Johnson Bronze Co.	i
Locomotive Stoker Co.	xv
McConway & Torley Co.	xv
National Malleable and Steel Castings Co.	iv
Niles-Bement-Pond Co.	vi

NAME	Page
O'Brien, Martin J., Co., Incorporated	Front Cover
Paxton-Mitchell Co.	iv
Pgh. Testing Laboratory	Front Cover
Pressed Steel Car Co.	xix
The Q. & Co.	ii
Railway Equip't. and Publication Co.	iii
Railway Steel Spring Co.	xvi
Safety Car Heat. & Lighting Co.	xvi
Schaefer Equipment Co.	v
Sipe, James B., & Co.	iv
Southern Wheel Co.	iii
Standard Safety Nut Corp.	Front Cover
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	iii
The Superheater Co.	Front Cover
Suydam, M. B., Co.	Back Cover
The Symington Co.	v
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xviii
U. S. Metallic Packing Co.	xvi
Vapor Car Heating Co., Inc.	xviii
Westinghouse Air Brake Co.	vii
Westinghouse Elec. & Mfg. Co.	vii



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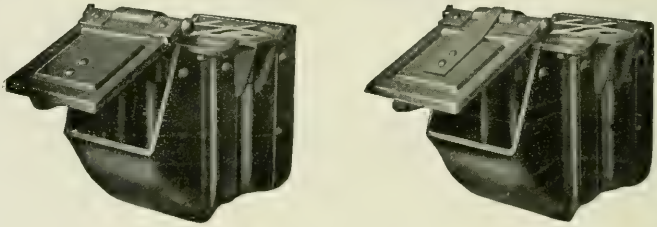

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No. 9

Pittsburgh, Pa., October 22, 1925.

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*—Deceased.

Meetings held fourth Thursday of each month except June, July and August.

PROCEEDINGS OF ANNUAL MEETING
OCTOBER 22, 1925

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., at 8 o'clock, P. M., President A. Stucki in the chair:

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Frey, A. R.
Fritz, A. A.
Fults, J. H.
Gardner, George R.
Geddes, James R
Gibson, G. A.

Gilg, Henry
Glenn, J. H.
Goda, P. H.
Grieve, R. E.
Guay, John W.
Haas, J. W.
Hale, C. E.
Hansen, William C.
Harger, M. L.
Harter, Arnold
Haskell, B.
Headington, R. V.
Herrold, A. E.
Hickling, F. G.
Holbrook, W. H.
Holmes, E. H.
Hood, J. M.
Hoover, J. W.
Hoover, R. C.
Howe, D. M.
Howe, D. M., Jr.
Hughes, John E.
Hulick, E. G.
Hussong, Albert C.
Hyde, W. B.
Hykes, W. H.
Jahnke, Karl W.
Johnson, A. B.
Johnson, H. M.
Johnson, Nelson E.
Johnston, W. A.
Joyce, Thomas J.
Karns, C. A.
Kaup, H. E.
Kavanagh, D. K.
Kelly, H. B.
Kelly, Harry S.
Kelly, J. P.
Kelly, L. J.
Kempton, J. W.
Kessler, Howard
Ketchpel, Paul A.
Kindle, W. F.
King, J. W.
King, J. W., Jr.
Kirkpatrick, H. F.
Kohl, H. J.
Kummer, Joseph H.
Kunkel, H. C.
Lanahan, J. S.
Lang, W. C.
Laughlin, Harry
Laughner, C. L.
Laurent, G. F.
Lawson, A. F.
Lawson, A. T.
Lee, L. A.
Lindberg, W. N.
Lobez, P. L.
Long, R. M.
Long, Walter
Luddy, W. E.
Ludwig, C. F.
Lynch, C. H.
Lynn, William
Maliphant, C. W.
Maloney, J. J.
Mann, N. T.
Manogue, W. T.
Manson, A. J.
Marlow, George A.
Marshall, W. T.
Matchett, H. K.
Merscher, John
Meschter, E. F.
Miller, George
Miller, John
Miller, R. E.
Milliken, James
Milliken, I. H.
Minnick, Frank G.
Mitchell, F. K.
Mitchell, W. S.
Mitchell, William J.
Monks, J. J.
Moore, D. O.
Morris, J. H.
Moyer, Oscar G. A.
Muir, Robert Y.
Mycoff, George H.
Myers, Arnold
McAbee, W. S.
McCornish, W. C.
McGeorge, D. W.
McGirk, John D.
McKirahan, J. R.
McLaughlin, Howard B.
McNiff, John L.
Noble, J. A.
Noonan, W. C.
O'Connor, M. J.
O'Connor, C. D.

O'Neill, Thomas J.
Orchard, Charles
Orndorff, J. R.
O'Toole, J. L.
Painter, Joseph
Passmore, H. E.
Penn, William
Peoples, James S.
Perkins, Charles F.
Pillar, Michael
Posteraro, S. F.
Proft, J. W.
Provost, S. W.
Purnell, C. S.
Rabold, W. E.
Ralston, John A.
Rauschart, E. A.
Redding, D. J.
Redding, J. H.
Redding, R. D.
Reed, Fred W.
Reeve, George
Renshaw, W. B.
Reynolds, D. E.
Ridgway, J. F.
Roberts, J. E.
Robinson, R. L.
Roth, Philip J.
Ryan, D. W.
Ryan, William F.
Salisbury, William
Saltic, Thomas
Sandman, A. G.
Sattley, E. C.
Scheck, H. G.
Schrader, A. P.
Schrechongost, C. P.
Seibert, W. L.
Sewell, H. B.
Shellenbarger, H. M.
Shannon, W. R.
Sheridan, Thomas F.
Simpson, Robert
Smith, R. W.
Snowden, H. J.
Snyder, F. I.
Snyder, Joseph
Sowash, F. E.
Spangler, C. P.
Spencer, E. W.
Spielmann, J. A.
Stark, F. H.
Stewart, Leonard S.
Stoller, Karl M.
Stritzinger, Frank R.
Stucki, A.
Sullivan, M. J.
Sutherland, L.
Thomas, E. K.
Tucker, John L.
Van Blarcom, W. C.
Walker, J. W.
Walther, G. C.
Warrensford, Fred S.
Waterman, E. H.
Watson, John
Weissert, W. J.
Wheatley, William
White, C. M.
Wildin, George W.
Winell, K. O.
Wilson, D. L.
Woernley, T. R.
Wolf, H. M.
Woodling, George V.
Wright, John B.
Myers, W. H.
Wyke, J. W.
Wynn, M. E.
Wynn, E. M.
Young, F. C.
Zimmerman, Samuel

VISITORS

Abel, C. W.
Ackerman, Joseph
Anger, J. G.
Ashton, William
Atkins, H. E.
Baird, R. M.
Bailey, W. G.
Bell, R. P.
Bell, W. R.
Binkley, Walter E.
Bishop, M. L.
Bochert, Carl G.
Bouchy, C. A.
Braun, L. H.

Brice, J. A.
Broge, Carl
Brown, R. J.
Burgess, T. S.
Burnett, R. H.
Calvert, John
Campbell, J. C.
Carey, C. D.
Carroll, Walter S.
Carter, John D.
Christy, William J.
Clements, Frank C.
Clifford, E. T.
Cobbett, Albert J.
Collins, Choate
Collins, H. M.
Connelly, W. G.
Conway, John
Copeland, T. F.
Cromwell, Howard T.
Cunningham, H. L.
Daerr, W. H.
Downes, D. F.
Drake, E. B.
Drylie, N. A.
Dugrud, J.
Ekis, E. I.
Emery, Frank
England, Don C.
Evans, W.
Evans, W. M.
Fields, D. S.
Fisher, G. M.
Fisher, W. R.
Fleckenstein, August
Fogel, Charles Z.
Follett, W. F.
Forrester, James B.
Foster, E. C.
Fowler, W. E.
Fox, George W.
Gaffney, Thomas H.
Gillmore, George
Gillen, John B.
Gipson, A. M.
Givler, Hugh C.
Glatz, F. J.
Gress, D. N.
Grove, L. T.
Guff, Thomas G.
Gunnison, W.
Haller, Nelson M.
Hallstein, George W.
Hancock, M. L.
Hann, Ernest E.
Hare, Scott, Jr.
Helbling, C. P.
Herman, J. R.
Hildebrand, L. B.
Hilstrom, A. V.
Hetzel, L. C.
Hogle, H. E., Jr.
Holaday, W. M.
Holland, Howard L.
Horner, R. J.
Horsfall, W.
House, Ray W.
Hurray, Charles A.
Jex, W. A.
Johnson, E. H.
Johnson, O. E.
Kamerer, R. W.
Kelly, H. T.
Ketterer, F. P.
Kirkpatrick, W. R.
Kipp, Ralph H.
Klinefelter, F. A.
Knapp, John A.
Knowles, Charles R.
Kohl, C. F.
Kredel, E. J.
Kumer, J. C., Jr.
Landefeld, R.
Latshaw, Todd R.
Lamb, W. S.
Leck, G. J.
Lewis, S. B.
Lindberg, C. T.
Lippert, H. E.
Lloyd, D. W.
Long, Walter F.
Lothrop, E. E.
Loughridge, H. W.
Lynn, Charles A.
Lyons, J. C.
Macoubray, R. J.
Maple, Thomas S.
Marklin, F. N.
Marsden, R.
Mattern, G. W.
May, L. J.
Metzger, Christian L.

Meyer, F. N.
Mills, C. C.
Minett, C. A.
Moore, Harry R.
Mullard, E. H.
Murphy, P.
Myers, Charles H.
McAlonan, J. E.
McConn, G. E.
McCrudden, Frank A.
McCurdy, Clyde V.
McKinley, Arch.
McWilliams, G. M.
Nannah, F. J.
Nessle, J. B.
Nordenskjold, A. F.
O'Neil, J. T.
Packer, D. M.
Palmer, G. A.
Parker, James L.
Parsons, F. W.
Peat, Jim
Peiffer, Charles E.
Petrie, Charles F.
Petrie, J. S.
Petrie, William J.
Phillip, John N.
Phillips, William
Phlegan, A. B.
Piper, R. A.
Pitcher, William
Plank, L. G.
Plotner, C. W.
Prince, Albert
Reed, C. R.
Rehlin, T. G.
Rehlen, Walter C.
Rice, F. G.
Robeck, G. B.
Rohman, G. H.
Sargent, G. A.
Saupe, F. N.
Schuster, E. F.
Schweitzer, A. C.
Senger, Mr.
Shallenberger, C. S.
Shimer, J. H.
Showalter, Joseph
Shropshire, Paul
Sippel, Karl
Skiles, S. M.
Skiles, William C.
Smiley, A. L.
Smith, E. E.
Smith, O. W.
Smith, Sion B.
Sneck, Harry
Snyder, W. H.
Snyder, W. H.
Stalter, H. A.
Sterling, C. C.
Stevenson, Richard
Stutwire, Howard S.
Swenk, Raymond
Teckemeyer, F.
Thornton, H.
Tracey, T. M.
Uhler, J. P.
Van Endon, A. L.
Van Pelt, R. T.
Weitzel, A. G.
Werlin, William V.
Whitaker, U. A.
Whitaker, H. W.
Wibner, A. J.
Wilcox, H. C.
Wycisk, V.
Wynn, H. R.
Zeher, W. G.
Zulaby, Elmer W.

The call of the Roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with, as they are to appear in printed form.

The Secretary read the following list of applications for membership:

Allen, Raymond Lee, Engine House Foreman, P. & L. E. R. R., California, Pa. Recommended by J. J. Donovan.

Biggard, W. J., Elec. Foreman, P. & L. E. R. R., 2947 Stafford St., Pittsburgh, Pa. Recommended by R. M. Long.

Boyd, T. B., Asst. Chief, Bureau of Plant Engrg., Standard Steel Car Co., Mifflin Apt., Butler, Pa. Recommended by W. H. Altsman.

Brewer, George W., Trainmaster, Lake Erie & Eastern R. R. Co., 427 Caroline St., Youngstown, Ohio. Recommended by R. D. Redding.

Brice, James A., Chief Train Dispatcher, P. & L. E. R. R., Mill Street, Coraopolis, Pa. Recommended by F. G. Minnick.

Crowe, J. M., President Crowe Manufacturing Corporation, 133 East 3rd Street, Cincinnati, Ohio. Recommended by J. D. Conway.

Curly, Walter J., General Manager, Conley Tank Car Co., Oliver Bldg., Pittsburgh, Pa. Recommended by J. A. Ralston.

Emery, F. Paul, Engine Dispatcher, P. & L. E. R. R., Dickerson Run, Pa. Recommended by W. E. Beers.

Fisher, G. Malcom, Blacksmith, Union R. R., 568 Oakwood St., Pittsburgh, Pa. Recommended by A. F. Coulter.

Fleckenstein, August, P. W. Inspector, P. & L. E. R. R., 1108 Crucible St., 20th Ward, Pittsburgh, Pa. Recommended by Samuel Lynn.

Foster, E. C., Sales Department, Edgewater Steel Company, 614 Tenth St., Oakmont, Pa. Recommended by C. A. Karns.

Goron, F. W., Asst. General Foreman, P. & L. E. R. R., 834 Broadway, McKees Rocks, Pa. Recommended by H. B. Kelly.

Gregory, C. A., Engine House Foreman, P. & L. E. R. R., 766 Cassius Avenue, Youngstown, Ohio. Recommended by R. D. Redding.

Hammerstrom, R., Chief, Bureau of Plant Engrg., Standard Steel Car Company, 234 W. Pearl St., Butler, Pa. Recommended by W. H. Altsman.

Hann, Ernest E., Passenger Clerk, Conemaugh Division, P. R. R. System, 118 Jane St., McKees Rocks, Pa. Recommended by T. M. Blakley.

Hamilton, William, Manager, Railway Sales Department, The Ferbert Shorndorfer Co., P. O. Box 106, East Liberty Sta., Pittsburgh, Pa. Recommended by J. A. Ralston.

Hilstrom, Anton V., Machinist, P. & L. E. R. R., 237 Halket St., Pittsburgh, Pa. Recommended by Nelson E. Johnson.

Hodge, Edwin, Jr., President, Pittsburgh Knife & Forge Company, Drawer "C," Coraopolis, Pa. Recommended by W. H. Schoen, Jr.

Hogle, H. E., Jr., Sales Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Recommended by C. S. Purnell.

Jackson, Charles, Electrician, P. & L. E. R. R., 2711 Walnut St., McKeesport, Pa. Recommended by R. M. Long.

Jones, D. J., President and Manager, Ellwood Stone Co., 320 Spring Ave., Ellwood City, Pa. Recommended by H. B. Kelly.

Kamerer, R. W., Terminal Agent, P. & L. E. R. R., Terminal Annex Bldg., Pittsburgh, Pa. Recommended by F. G. Minnick.

Ketterer, Frederick P., Chief Train Dispatcher, P. & L. E. R. R., 2741 Ocean Ave., Dormont, Pa. Recommended by F. G. Minnick.

King, T. C., Manager Railroad Sales, Pittsburgh Knife & Forge Co., Drawer "C," Coraopolis, Pa. Recommended by W. H. Schoen, Jr.

Klinefelter, F. A., Foreman of Equipment, P. H. B. & N. C. R. R., Harmony, Pa. Recommended by W. H. Altsman.

Landefeld, Reinhard, Pipefitter, P. & L. E. R. R., 114 Earl St., Corliss Sta., Pittsburgh, Pa. Recommended by R. M. Long.

Mills, C. C., General Manager, Unity Railways Co., 621 Union Trust Bldg., Pittsburgh, Pa. Recommended by C. O. Dambach.

Morris, J. M., Traffic Manager, National Tube Co., 1922 Frick Bldg., Pittsburgh, Pa. Recommended by L. C. Bihler.

Nannah, F. J., Engineer of Construction, P. & L. E. R. R., Pittsburgh, Pa. Recommended by F. G. Minnick.

Neal, O. H., Eastern Manager, Union Asbestos & Rubber Co., 30 Church St., New York, N. Y. Recommended by J. A. Ralston.

Palmer, E. A., Mgr. Lt. Traction Div. Ry. Dept., Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. Recommended by F. G. Hickling.

Pickard, S. B., Chief Electrician, P. & L. E. R. R., 918 Eleventh St., Beaver Falls, Pa. Recommended by R. M. Long.

Prince, Albert, Asst. Foreman, P & L. E. R. R., 113½ Sanford St., Corliss Sta., Pittsburgh, Pa. Recommended by R. M. Long.

Robinson, George H., Air Brake Machinist, P. & L. E. R. R., 58 Chautauqua St., N. S., Pittsburgh, Pa. Recommended by R. M. Long.

Smith, E. E., General Passenger Agent, P. & L. E. R. R., Terminal Annex Building, Pittsburgh, Pa. Recommended by F. G. Minnick.

Swenk, Raymond, Division Engineer, Penna. Railroad System, Room 207 Pennsylvania Station, Pittsburgh, Pa. Recommended by J. L. Cunningham.

Whitaker, U. A., Test Engineer, Westinghouse Air Brake Company, 353 Marguerite Avenue, Wilmerding, Pa. Recommended by George L. Cotter.

Wikander, Oscar R., Mechanical Engineer, Ring Spring Dept., Edgewater Steel Co., 900 South Negley Ave., Pittsburgh, Pa. Recommended by D. W. McGeorge.

Wood, John, Telegraph Operator, P. & L. E. R. R., 712 Sixth Street, Monessen, Pa. Recommended by Sam A. Damore.

Woodling, George V., Train Control Inspector, P. & L. E. R. R., 1218 House Building, Pittsburgh, Pa. Recommended by F. K. Mitchell.

Wynn, H. R., Yardmaster, Mon. Con. R. R. Co., 639 Minnesota St., Pittsburgh, Pa. Recommended by C. M. White.

Zeher, William G., Foreman of Construction, Mon. Con. R. R. Co., 23 Forrester St., Fifteenth Ward, Pittsburgh, Pa. Recommended by C. M. White.

PRESIDENT: These applications will be referred to the Executive Committee in due course, and upon approval by them, the gentlemen will become members without further action than the payment of the current year's dues.

The Secretary announced the death of a member of the Club, Mr. C. W. Langhorst, who died September 24, 1925.

PRESIDENT: Appropriate memorial will appear in the Official Proceedings of the Club.

VICE-PRESIDENT FRANK G. MINNICK: We have a member who at one time served as president of this organization, who was for many years a member and an earnest, energetic worker in the interests of the Railway Club of Pittsburgh. He is unfortunate to the extent that he has been ill and incapacitated for a very considerable period of time. I understand tonight he is somewhat improved and I am sure we all hope, on the way to complete recovery. I have reference to Mr. Frank R. McFeatters, General Superintendent of the Union Railroad and a past president of the Club. I therefore desire to offer a motion that the Secretary be directed to address a communication to Mr. McFeatters on behalf of the Railway Club of Pittsburgh, expressing our sympathy in his illness and our hope for his speedy return to complete health, and that flowers be sent to him as early as possible.

The motion was duly seconded and prevailed by unanimous vote.

PRESIDENT STUCKI: The next in order is the report of the election of officers.

The Secretary read the report of the Tellers as follows:

PRESIDENT—Frank G. Minnick.

FIRST VICE PRESIDENT—George W. Wildin.

SECOND VICE PRESIDENT—J. L. Cunningham.

TREASURER—F. H. Stark.

SECRETARY—J. D. Conway.

EXECUTIVE COMMITTEE—L. H. Turner, Chairman, D. J. Redding, A. G. Mitchell, J. G. Code, D. M. Howe, J. A. Spielmann, H. H. Maxfield, Frank J. Lanahan, Samuel Lynn, D. F. Crawford, George D. Ogden, A. Stucki.

FINANCE COMMITTEE—E. C. Sattley, Chairman, J. A. Beattie, 1 year, C. O. Dambach, E. A. Johnson, E. J. Searles, 2 years.

RECEPTION COMMITTEE—F. H. Freshwater, Chairman, W. E. Fowler, Jr., 1 year, J. L. Smith, E. Emery, 2 years, M. A. Smith, Col. H. C. Nutt, H. E. Passmore, Robert Rogers, Jr., 3 years.

MEMBERSHIP COMMITTEE—J. A. Ralston, Chairman, H. E. Chilcoat, A. D. Chittenden, M. W. Clement, 1 year, E. J. Devans, Harry B. Kelly, R. M. Long, 2 years, Col. James Milliken, J. T. Campbell, A. P. Schrader, 3 years.

ENTERTAINMENT COMMITTEE—Henry F. Gilg, Chairman, 3 years, Joseph H. Kummer, 2 years, S. E. Van Vrankin, 3 years.

SUBJECT COMMITTEE—Charles Orchard, Chairman, John B. Wright, 1 year, J. S. Lanahan, 2 years.

PRESIDENT: The Club is to be congratulated upon this notable list of officers. We would like to have a word or two from some of the incoming officers, as to their impression of the past and their hopes for the future. Mr. Minnick, may we hear from you?

MR. FRANK G. MINNICK: Mr. President, fellow Members of the Railway Club of Pittsburgh and Guests: It is with a sense of humble pride that I heard the announcement that I had been elected President of the Railway Club of Pittsburgh by a vote that seemed to be unanimous. I want to say that I know what it requires to conduct the affairs of a Club of the proportions of the Railway Club of Pittsburgh. There is not a great deal demanded of a president, but there is an enormous amount of work required of the committees, particularly their chairmen, and of the individual members, if the Club is to be successful. And I want to ask, on behalf of myself and the other officers of the Club, the same loyal support from each and every member of the Club that the outgoing officers for the year just passed have had. If we can have that, I am sure the Railway Club of Pittsburgh will continue to grow and prosper. I thank you.

PRESIDENT STUCKI: Most of you know your first Vice President, Mr. Wildin. May we hear from him?

MR. GEORGE W. WILDIN: Mr. President, Members of the Railway Club of Pittsburgh and Guests: I fully appreciate the signal honor you have conferred upon me tonight by electing me as your First Vice President. It has been a great pleasure for me, during the past year or two, to associate with the officers and members of this Club. I have had a great deal of experience in railway club affairs in other organizations of a similar nature, and I want to say this for the Railway Club of Pittsburgh, that you have two attributes that make for success in an unusual degree, intelligence and democracy. I do not know that I was ever associated with a club that was as democratic as this Club is. And with intelligence, democracy, and a direction of the proper officers, there is no reason why the Club in the future should not make even better history than it has in the past.

I want to thank you again for the promotion, and I will endeavor to conduct myself so that when the examination comes a year hence I can pass, and will not have betrayed the confidence you have reposed in me. I thank you.

PRESIDENT: We now come to the Annual Reports of Officers. We will hear first from the Secretary.

SECRETARY'S REPORT

Pittsburgh, Pa., October 22, 1925.

To the Officers and Members of
The Railway Club of Pittsburgh.

Gentlemen:

The following is a summary of membership and financial statement for the fiscal year ended October 22, 1925:

MEMBERSHIP

Reported last year	1,073	
Received into membership during the year	207	
		1,280
Suspended, non-payment of dues	82	
Resigned	49	
Loss of address	18	
Died	11	
		160
Present membership		1,120

Of the above membership four are honorary. They are: D. C. Buell, Samuel O. Dunn, Julian Kennedy and John A. Penton.

NAMES OF DECEASED MEMBERS

The following deaths were reported during the year 1924-1925: Howard L. Beach, Leven J. Gwinn, H. S. Hunter, E. Z. Jefferson, Robert Kaiser, C. W. Langhorst, F. M. McNulty, E. W. Newell, H. B. Pierce, F. C. Riddile and E. H. Utley.

FINANCIAL

Receipts

In hands of Treasurer at close of last year	$5,545.73	
From dues	2,835.00	
From advertisements	1,944.67	
From sale of tickets, Smoker October 23, 1924	536.00	
Cash collected for dinner October 23, 1924	198.00	
From sale of Official Proceedings	16.25	
From interest, Liberty Bonds and Bank Balance	138.85	
		$11,214.50

Disbursements

Printing Proceedings, notices, mailing etc.	$2,151.03	
Hall, luncheon, cigars, etc., for meetings	830.94	
Reporting Proceedings of meetings	180.00	
Luncheon, entertainment, etc., Smoker October 23, 1924	964.45	
Messenger service and affidavits	17.50	
Moving pictures	25.00	
Premium on bonds, Treasurer and Secretary	17.50	
Lock Box for Treasurer	2.00	
For expenses for speaker at meeting	42.11	
Flowers, floral tributes	45.00	
Salary of Secretary and advertising expenses	794.47	
		$ 5,070.00
Net balance		$ 6,144.50

Cash is made up of $3,144.50 and $3,000.00 in Liberty Bonds.

J. D. CONWAY, Secretary.

Approved:

L. H. TURNER, Chairman

D. J. REDDING,
A. G. MITCHELL,
J. G. CODE,
D. M. HOWE,
J. A. SPIELMANN,
H. H. MAXFIELD,
FRANK J. LANAHAN,
SAMUEL LYNN,
D. F. CRAWFORD,
GEORGE D. OGDEN,
A. STUCKI,

Executive Committee.

PRESIDENT: You have heard a very splendid report from your Secretary. What is your pleasure?

Upon motion, the Report was accepted and directed to be inserted in the minutes of the meeting.

PRESIDENT: We will now hear the report of the Treasurer, Mr. F. H. Stark.

TREASURER'S REPORT

Pittsburgh, Pa., October 22, 1925.

To the Officers and Members of
The Railway Club of Pittsburgh.

Gentlemen:

I herewith submit Treasurer's report for the year ended October 22, 1925:

ON HAND AND RECEIPTS

On hand October 23, 1924, including three $1,000.00 Liberty Bonds	$5,545.73	
Received from Secretary during year	5,529.92	
Interest on Bonds and Bank Balance	138.85	
Total		$11,214.50

DISBURSEMENTS

Paid on Secretary's Vouchers, Nos. 487 to 521, inclusive	$ 5,070.00
Balance October 22, 1925	$ 6,144.50

RESOURCES

Three Liberty Bonds, $1,000.00 each	$ 3,000.00	
Cash in bank	3,144.50	
Total		$ 6,144.50

F. H. STARK, Treasurer.

Approved:

L. H. TURNER, Chairman

D. J. REDDING,
A. G. MITCHELL,
J. G. CODE,
D. M. HOWE,
J. A. SPIELMANN,
H. H. MAXFIELD,

FRANK J. LANAHAN,
SAMUEL LYNN,
D. F. CRAWFORD,
GEORGE D. OGDEN,
A. STUCKI,

Executive Committee.

PRESIDENT: We are still going in the right direction What is your pleasure as to this report:

Upon motion, the report was accepted and directed to be inserted in the minutes of the meeting.

We have audited the accounts of the Secretary and Treasurer and find them correct as reported.

E. C. SATTLEY, Chairman,
E. A. JOHNSON,
E. J. SEARLES,
Members Finance Committee.

PRESIDENT: At our last meeting a proposed Amendment to the Constitution was presented, and it becomes necessary to take action on those proposed Amendments tonight. The Secretary will kindly read the proposed Amendments presented at our last meeting.

SECRETARY: The proposed Amendments are as follows:

CONSTITUTION—ARTICLE IV—OFFICERS: Recommended that Finance Committee be changed to read—"consisting of five or more members."

Membership Committee be changed to read "consisting of seven or more members."

Reception Committee be changed to read, "consisting of six or more members."

Subject Committee be changed to read, "consisting of three or more members."

The term of office of the Finance, Membership, Reception and Subject Committees shall be specified at the time of the Annual Election, but the term of office of the members of the Committees named shall not exceed three years.

COLONEL JAMES MILLIKEN: Have these proposed Amendments been submitted to the Executive Committee and have they approved them?

PRESIDENT: They have been submitted to the Executive Committee and have their approval.

Upon motion, the proposed Amendments to the Constitution were adopted without dissent.

PRESIDENT: We now come to the end of the formal business meeting, and I will, therefore, turn further proceedings over to Mr. Emery, Chairman of the Entertainment Committee.

MR. D. J. REDDING: Mr. President, during the year that you have served as President of this Club you have accomplished a great deal for the Club. Prior to that time, you were

Chairman of the Membership Committee and through the untiring efforts of yourself and your committee, you increased very materially the membership of the Club. The members all appreciate the interest you have taken in the Club ever since you have been a member and an officer, and in finishing your term as President, they want you to take with you something that will remind you of the pleasant fellowship that they have enjoyed with you, and which they have every right to believe they will continue to enjoy, even though you cease to be President, as there is no thought in the mind of any of us that you are going to cease your activities simply because you are no longer President.

The token which has been selected for you to carry with you out of office is this beautiful watch, chain and pen knife, and I can assure you that I speak for every member in the organization when I say that the best wishes and hearty friendship of every member of this Club goes with this present.

MR. STUCKI: We all have supreme moments in our lives, and this is mine. I really am not able to express my feelings at this moment. Some one must have been a mind reader, however. I have a watch which has served me for fifty years, and a good many recollections are attached to it. But that watch is worn out, so much so, in fact, that I have to set it every other day, and even then I miss many trains. And occasionally I miss appointments, both business and golf and otherwise, but my watch is my excuse. I will confess that occasionally I am late at the office, and again my watch is my alibi. Not often, but occasionally, I play cards until the wee hours of the morning, not by design, but because the watch is off! But now my troubles are over. I shall look at this watch oftener than I did at the old one, and every time I look at it, it will bring happy memories. It is a masterpiece; it is a jewel; and it is just in harmony with you good friends who give it to me.

This watch is especially prized by me for another reason. I could buy a watch, but an inscription like that can not be bought, it must be earned. I should say, it ought to be earned, for I have not earned it. I have done hardly a thing this whole year. While you had meetings here I was on the other side of this little globe. I was thinking of you and I was looking up to you and I wrote to you through our good Secretary. Last year I did do a little more. When my genial predecessor was moved to Philadelphia, I helped out possibly oftener than I did this year. And before that I was connected with the Membership Committee, and Mr. Ralston knows what that means. To go back still farther, I was a charter member of this Club, and ever since its organization I have considered it a great privilege and a great pleasure to be present at the meetings. And I want to say that in the future you will find me among you the same as in the past, for I still consider it a privilege to come here and meet with you and discuss matters with you, and it will now be a still greater pleasure than it was in the past. Gentlemen, I thank you most sincerely.

SECRETARY CONWAY: Mr. Stucki has very modestly deprecated the work he did for the Club last year. I think it only fair to say that there are few members of the Club who have worked more faithfully, beginning with 1901, and up to the present time, than has Mr. Stucki, our retiring president. He has always been active and enthusiastic in the interest and welfare of the Club, and this always in that genial, smiling manner in which we all know him

MR. STUCKI: This watch will be among my most precious possessions as long as I live, and I thank you very much.

Mr. Emery will now take charge.

Under the auspices of the Entertainment Committee, a very high-class vaudeville entertainment was presented, followed by a luncheon in the dining hall. And an expression of thanks and appreciation was tendered to the Committee for its eminently successful efforts.

J. D. CONWAY, Secretary.

CONSTITUTION

ARTICLE I

The name of this organization shall be "THE RAILWAY CLUB OF PITTSBURGH."

ARTICLE II

OBJECTS

The objects of this Club shall be mutual intercourse for the acquirement of knowledge, by reports and discussion, for the improvement of railway operation, construction, maintenance and equipment, and to bring into closer relationship men employed in railway work and kindred interests.

ARTICLE III

MEMBERSHIP

SECTION 1. The membership of this Club shall consist of persons interested in any department of railway service or kindred interests, or persons recommended by the Executive Committee upon the payment of the annual dues for the current year.

SEC. 2. Persons may become honorary members of this Club by a unanimous vote of all members present at any of its regular meetings, and shall be entitled to all the privileges of membership and not be subject to the payment of dues or assessments.

ARTICLE IV

OFFICERS

The officers of this club shall consist of a President, First Vice President, Second Vice President, Secretary, Treasurer, Finance Committee consisting of five or more members, Membership Committee consisting of seven or more members, Entertainment Committee consisting of three members, Reception Committee consisting of six or more members, Subject Committee consisting of three or more members, and an Elective Executive Committee of three or more members. The officers named shall serve a term of one year from date of their election with the exception of the Finance, Membership, Entertainment, Reception and Subject Committees; the term of office of these committees shall be specified at the time of the Annual Election, but the term of office of the members of such committees shall not exceed three years.

ARTICLE V

DUTIES OF OFFICERS

SECTION 1. The President shall preside at all regular or special meetings of the Club and perform all duties pertaining to a presiding officer; also serve as a member of the Executive Committee.

SEC. 2. The First Vice President, in the absence of the President, will perform all the duties of that officer; the Second Vice-President, in the absence of the President and First Vice President, will perform the duties of the presiding officer. The First and Second Vice President shall also serve as members of the Executive Board.

SEC. 3. The Secretary will attend all meetings of the Club or Executive Committee, keep full minutes of their proceedings, preserve the records and documents of the Club, accept and turn over all moneys received to the Treasurer at least once a month, draw cheques for all bills presented when approved by a majority of the Executive Committee present at any meetings of the Club, or Executive Committee meeting. He shall have charge of the publication of the Club Proceedings and perform other routine work pertaining to the business affairs of the Club under the direction of the Executive Committee.

SEC. 4. The Treasurer shall receipt for all moneys received from the Secretary, and deposit the same in the name of the Club within thirty days in a bank approved by the Executive Committee. All disbursements of the funds of the Club shall be by cheque signed by the Secretary and Treasurer.

SEC. 5. The Executive Committee will exercise a general supervision over the affairs of the Club and authorize all expenditures of its funds. The elective members of this Committee shall also perform the duties of an auditing committee to audit the accounts of the Club at the close of a term or at any time necessary to do so.

SEC. 6. The Finance Committee will have general supervision over the finances of the Club, and perform such duties as may be assigned them by the President or First and Second Vice Presidents.

Sec. 7. The Membership Committee will perform such duties as may be assigned them by the President or First and Second Vice Presidents, and such other duties as may be proper for such a committee.

Sec. 8. The Entertainment Committee will perform such duties as may be assigned them by the President or First and Second Vice Presidents, and such other duties as may be proper for such a committee.

ARTICLE VI

ELECTION OF OFFICERS

Section 1. The officers shall be elected at the regular annual meeting as follows, except as otherwise provided for:

Sec. 2. Printed forms will be mailed to all the members of the Club, not less than twenty days previous to the annual meeting, by the elective members of the Executive Committee. These forms shall provide a method, so that each member may express his choice for the several offices to be filled.

Sec. 3. The elective members of the Executive Committee will present to the President the names of the members receiving the highest number of votes for each office, together with the number of votes received.

Sec. 4. The President will announce the result of the ballot and declare the election.

Sec. 5. Should two or more members receive the same number of votes, it shall be decided by a vote of the members present, by ballot.

ARTICLE VII

AMENDMENTS

Amendments may be made to this Constitution by written request of ten members, presented at a regular meeting and decided by a two-thirds vote of the members present at the next regular meeting.

BY-LAWS

ARTICLE I

MEETINGS

SECTION 1. The regular meetings of the Club shall be held at Pittsburgh, Pa., on the fourth Thursday of each month, except June, July and August, at 8 o'clock P. M.

SEC. 2. The annual meeting shall be held on the fourth Thursday of October each year.

SEC. 3. The President may, at such times as he deems expedient, or upon request of a quorum, call special meetings.

ARTICLE II

QUORUM

At any regular or special meeting nine members shall constitute a quorum.

ARTICLE III

DUES

SECTION 1. The annual dues of members shall be Two Dollars, payable in advance on or before the fourth Thursday of September each year.

SEC. 2. The annual subscription to the printed Proceedings of the Club shall be at the published price of One Dollar. Each member of the Club shall pay for both dues and subscription. Dues and subscription paid by members proposed at the meetings in September or October shall be credited for the following fiscal year.

SEC. 3. At the annual meeting members whose dues and subscription are unpaid shall be dropped from the roll after due notice mailed them at least thirty days previous.

SEC. 4. Members suspended for non-payment of dues shall not be reinstated until all arrearages have been paid.

ARTICLE IV

ORDER OF BUSINESS

1—Roll call.

2—Reading of the minutes.

3—Announcements of new members.

4—Reports of Committees.

5—Communications, notices, etc.

6—Unfinished business.

7—New business.

8—Recess.

9—Discussion of subjects presented at previous meeting.

10—Appointment of committees.

11—Election of officers.

12—Announcements.

13—Financial reports or statements.

14—Adjournment.

ARTICLE V

SUBJECTS—PUBLICATIONS

SECTION 1. The Subject Committee will provide the papers or matter for discussion at each regular meeting.

SEC. 2. The Proceedings or such portion as the Executive Committee may approve shall be published (standard size, 6x9 inches) and mailed to the members of the Club or other similar clubs with which exchange is made.

ARTICLE VI

The stenographic report of the meetings will be confined to resolutions, motions and discussions of papers unless otherwise directed by the presiding officer.

ARTICLE VII

AMENDMENTS

These By-Laws may be amended by written request of ten members, presented at a regular meeting, and a two-thirds vote of the members present at the next meeting.

In Memoriam

C. W. LANGHORST,

Died September 24, 1925.

MEMBERS

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Before me, a Notary Public, in and for the State and County aforesaid, personally appeared J. D. Conway, Secretary, who, having been duly sworn according to law, deposes and says that he is Editor and Publisher of the Official Proceedings—Railway Club of Pittsburgh.

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